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EDITORIAL

THE 1957 balance sheet is published elsewhere in this issue. The overall credit balance standing at £1 618 is almost double what it was in 1952 and shows, probably, as good financial progress as does any other journal in the country. It will be noted, too, the subscription has not been raised.

Amateur editors of this journal do not have an enviable task. They are not given a course in editing and they do not, unfortunately, receive the unanimous support of medical and dental officers. Brickbats arrive from time to time, but very little in the way of constructive criticism or encouragement. However, if they reap scanty rewards on earth, they reap a much more valuable reward in Heaven. The outgoing editors are grateful for permission to publish the following lines* which, they feel confident, apply to all medical editors.

The Editor stood 'fore the Heavenly Gate,
  His features pinched and cold.
He bowed before the Man of Fate,
  Seeking admission to the Fold.
"What have *you* done," St. Peter asked,
  "To gain admission here?"
"I was the Journal's editor, Sir,
  "For many a weary year."
The pearly gates swung open wide,
  As Peter pressed the bell.
"Come in and choose your harp!" he cried,
  "You've had your share of H—l!"

*Quoted at a meeting of the Union Internationale De La Presse Médicale, in London, September 1957, by Professor William Doolin of Dublin.

Articles

A BRIEF REVIEW OF AVIATOR'S DECOMPRESSION SICKNESS AND THE HIGH ALTITUDE SELECTION TEST

BY

Surgeon Lieutenant V. PARSONS, R.N.V.R.

It may come as a surprise to some that decompression from sea level to high altitude can give rise to an equal variety of symptoms as those experienced by a deep sea diver swiftly ascending to the surface. Such is the variety of these symptoms that Behnke (1955) has remarked that "the nascent gas bubble is replacing the spirochaete as 'the great imitator'." In this paper various aspects of aviation decompression sickness are considered while other hazards of a reduced barometric pressure such as hypoxia, ear and sinus barotrauma and hyperventilation are excluded.

Historical Sketch

1670 Robert Boyle observed a "conspicuous bubble moving to and fro" in a viper's eye while the animal was in an exhausted receiver.

1917 Henderson (1917) predicted the possibility that decompression sickness might develop at an altitude greater than 20 000 feet.

1931 Margaria was the first to suffer and record the symptoms of joint pain in a decompression chamber at 30 000 feet (Barcroft *et al.* 1931).

1938 Dr. J. W. Heim suffered from severe paraplegia in a decompression chamber at 35 000 ft. (Boothby and Lovelace, 1938).

1943 A high incidence of joint pains or "bends" was reported in bomber crews flying at 35 000 ft. and a number of forced descents had to be made, while two out of three Spitfire pilots attacking pressure cabin reconnaissance aircraft flying at 42 000 feet suffered from almost incapacitating bends (Tobias, 1951).

1957 With the introduction of pressure cabins the incidence fell abruptly but air-crew are still faced with the possibility of flying in unpressurized aircraft or from sudden failure of cabin pressure in flight. At the time of writing at least 5 deaths in the air due to decompression sickness have been recorded (Mason, 1957), three of which in the open literature (Haymaker, Johnson and Downey, 1956). Although these numbers are small they do give a measure of the hazard and the incomplete solution of the problem.

The Comparison between Aviators and Divers, or Caisson Workers, Decompression Sickness

A comparison has been made between the symptoms experienced by four divers when subjected to either too rapid decompression from high atmosphere or to simulated altitude. It was observed that the areas affected by pain are remarkably similar irrespective of the conditions for bubble formation, i.e. at simulated altitude from nitrogen normally present in the body or following decompression from nitrogen previously absorbed by the body at high pressure. All the immediate symptoms can be explained on the basis of intravascular and extravascular gas bubbles and Behnke (1955) went on to show that a similar volume of nitrogen or other natural gas was available for bubble formation if the subject has either spent 30 minutes at 132 feet (5 Atmospheres absolute) followed by rapid decompression or at 38 500 feet (1/5 Atmosphere absolute) following rapid ascent. One distinguishing fact about the aviator's bubble is that carbon dioxide and water vapour contribute at least 50 per cent of its volume at 38,000 ft while above 65 000 ft (Barometric pressure $<$ 47 mm = vapour pressure of the body fluids at 37° C) bubbles of water vapour can arise *de novo* quickly receiving contributions of nitrogen, oxygen and carbon dioxide leading to complete blockage of the circulation.

The aviator also differs from the diver in that all his tissues are thoroughly saturated with nitrogen at ambient alveolar pressures, while the diver is usually only at depth long enough fully to saturate certain tissue areas. Thus, on decompression, only certain areas in the diver are super-saturated and along with the occasional difficulties of effective recompression, make a diver more prone to spinal cord and bone lesions than the aviator.

The Need of a High Altitude Selection Test

To avoid these hazards two measures are possible. The first is pre-oxygenation by breathing 100 per cent oxygen for four hours or more which removes sufficient nitrogen to prevent bubble formation and gives complete protection below 40 000 feet. The procedure is inconvenient, expensive in the use of oxygen and time, and finally almost impossible to fit into an operational programme. However, one company in the U.S.A. is reported to have made preoxygenation compulsory for its test pilots (Flickinger *et al.*, 1955).

The second is the pre-selection of flying personnel with a view to excluding those particularly susceptible to decompression sickness from flying above 30 000 ft. This height has been chosen as symptoms very rarely develop below this level although bubbles are present at this altitude (Smedal, 1948). A degree of selection is already present in the high medical standards required for air crew and selection cannot be extended at this point beyond excluding those severely overweight. A patent foramen ovale is a definite extra hazard as the lung filter is removed for gas and fat emboli, but the detection of this abnormality is not easy without the use of ancillary techniques. Diets are

being planned with a mind to cutting down gas-producing foods and those that would lead to obesity

Unfortunately susceptibility varies with a number of known and unknown factors, and the problem is to arrange the test so that it will bear some relationship to the individual's susceptibility on the one hand, and to operational requirements on the other. An interesting example was of an individual who was exposed to 43,000 ft. for 30 minutes per day for 82 exposures. He only experienced one attack of bends in the first 75 runs but symptoms got worse after this, and he finally suffered hemianopia on the 82nd run (Hall et al. 1952). With exercise at altitude it is possible to induce bends in the majority of air crew, a result which is of no help in selection but of value in indoctrination.

The evolution of pre-selection tests is a chequered one, partly because the test has been used as a means of investigating the incidence and frequency of decompression sickness while the application of the results obtained, to the final direction of air crew to duties, has been determined by considerations of man-power. On the other side is the conviction that no test so far designed with the time available will indicate the real susceptibility of the individual in a particular situation. This difficult subject has been reviewed by Henry and Ivy (1951).

The Royal Navy has been fortunate in that the requirements for bomber crews are minimal and that there is an outlet for air crew, found too susceptible, in the anti-submarine and helicopter roles. With these considerations in mind the pre-selection test at the Royal Naval Air Medical School has not been altered for over seven years. It has been retained, not only on the grounds of pre-selection, but also for the unique opportunities it gives for the indoctrination of air crew in the early symptoms of decompression sickness, and the use of oxygen and other safety equipment at high altitude. They leave with an informed and healthy respect for high altitude.

The High Altitude Selection Test

The present test consists of three exposures to 37,000 ft. in a decompression chamber, with no enforced exercise, on alternate days in one week, repeated every four years. This altitude, reached in seven minutes from take-off, breathing 100 per cent. oxygen, has been chosen because, although a higher altitude would reveal more symptoms it would introduce the complication of having to breathe oxygen under pressure.

One hour has been chosen as a reasonable time to discover the majority of susceptibles, although it is well known that symptoms continue to occur up to two hours after exposure.

From fig. 1, showing the incidence and distribution of severe symptoms, it can be seen that over the last three time cells there is a steadily decreasing incidence of symptoms. If this expression rate were extrapolated for another 60 minutes only another 2 per cent. of subjects would suffer from serious

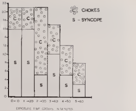


FIG. 1.—Showing the incidence of the main severe symptoms against increasing length of exposure

symptoms. However, there is much to commend a two hour exposure if a high proportion of susceptibles are to be discovered, but it has been a matter of policy to keep a standard test over the years so that its worth could be estimated. The number of air crew returning for re-categorization, because of severe symptoms in the air, has been of the order of one every three years, a rate which, considering the many variables, can hardly disprove the utility of the test. To eliminate some variables, three runs to altitude are given. This is another arbitrary decision the usefulness of which is discussed later.

Categorization

The basis of categorization is a functional one and not necessarily related to any particular type of vascular or tissue bubble formation. Three categories are used according to the disabilities suffered.

Category "A". Minimal symptoms and signs such as transient aches in the limbs, pruritus and mottled rashes due to tissue bubbles. Descent within the hour is unnecessary. Approximately 60 per cent. of air crew fall into this category.

Category "B". Mild symptoms. Here the subject has ample warning of the onset of symptoms which would allow him to descend to a safer altitude. The tissue bubbles develop within and around the joints giving rise to "bends", referred pain is common and may lead to reflex weakness of the

limbs Recent and past injury which hinders nitrogen clearance from the tissues movement and stretching of the joint, encouraging bubble formation, are the main predisposing factors As the pain increases, descent has to be made the bends easing around 25 000 ft but at no time is the subject seriously disabled by the symptoms, and he is allowed a further run in case he may be susceptible to severe symptoms which were masked by an early descent due to bends Masking has been shown by the fast vital capacity tracing giving a picture of incipient chokes although there were no pulmonary symptoms Occasionally gut distension may not be cleared, making descent necessary (*see below*)

Such a category does not allow a pilot to fly above 30 000 ft unpressurized If pressurization does fail he has experience of bends and will be able to descend before they are severe Approximately 30 per cent of air crew fall into this category

Category " C " Severe symptoms Here the subject suffers from such symptoms as to render him incapable of a controlled descent of his aircraft The symptoms are widespread, relieved by rapid descent, with occasional sequelæ at ground level The subject is not allowed another exposure and is unfit to fly above 30 000 ft whether pressurized or not Less than 10 per cent of air crew fall into this category

As such a decision narrows the aviator's sphere of operation to low altitude, and is often regarded subconsciously as an inability to "take it," the symptoms and ætiology are discussed in more detail below

Four broad groups can be defined although in a few cases it is difficult to assign them exclusively to one group

(1) *Syncope*

(*a*) Uncomplicated Syncope The subject has a momentary sense of dizziness, begins to sweat profusely and quickly loses consciousness Recovery is rapid on descent but he remains pale the blood pressure and pulse-rate falling by about 20 points from "pre flight" levels This is a type of vasovagal faint encouraged possibly by aero-embolism at a central level causing cerebrovascular spasm The part played by anxiety cannot be excluded, a high proportion occurring on first runs

(*b*) Syncope Preceded by Central Nervous System Signs These vary from scotomata, diplopia tunnel vision hyperæsthesia, anæsthesia and spastic types of mono- and hemiplegia Convulsions are common but rarely of the *grand mal* variety vomiting into the oxygen mask is a serious complication Pain is absent but migraine-like symptoms are common during and after descent Upsets in the circulation are not so marked as in the previous group Again vessel spasm is implicated rather than intercellular bubbles and the rare occurrence of spinal cord symptoms in contrast to divers decompression sickness make this group particularly interesting Although no retrospective data is available they may represent those who are particularly susceptible to cerebrovascular spasm a migraine diathesis

(c) Syncope Preceded by Severe Bends In these subjects the pain is severe and rapidly spreads within a minute to envelop the limb Extreme restlessness heralds the inevitable collapse and descent is often made before this phase Although there is some warning of the onset it is too short a period of useful consciousness The rapidity with which the bubbles develop is occasionally demonstrated by bruising after the exposure, an indication of capillary rupture

(2) *Chokes*

The first sensation is a burning substernal pain followed by increasing dyspnœa A deep inspiration at this phase will induce a paroxysm of coughing, with cyanosis and eventually pallor and syncope hypoxia may contribute to the latter The symptoms are eased on descent but difficulty in breathing, cyanosis, coughing, especially on smoking, continue for some hours at ground level The mechanism of this dyspnœa is probably a multiple one Behnke (1955) seeks to explain the whole syndrome on the basis of intravascular bubbles collecting in the pulmonary venous circuit, drawing a parallel between the dyspnœa suffered by dogs following the injection of starch granules and the symptoms of chokes However Ferris *et al* (1951) are quite emphatic that the primary lesion is in the mucous membrane of the bronchopulmonary passages and mention the close relationship between skin lesions and the incidence of chokes This concept of the " pulmonary itch " ties in well with the symptoms of the burning pain (cf acute tracheo bronchitis), the persistence of irritation and the late development of symptoms following recompression Vital capacity tests carried out by the writer and performed following decompression suggest similar changes to those found in bronchial asthma and pulmonary œdema

(3) *Abdominal Distension*

The viscera contain a certain amount of gas at ground level, this volume is increased by about five times on ascent the majority of subjects have little difficulty in clearing this collection, especially after repeated runs A few have been unable to clear flatus at all have suffered such colicky pain or respiratory difficulty with a raised diaphragm, that immediate descent was necessary If this occurs on repeated runs it would be a hazard in flight, particularly if explosive decompression took place (a loss of cabin pressure in less than 0 1 sec.) Thus the cause in this case is partly due to nitrogen passing into gas spaces but mainly to an anatomical abnormality slowing flatus evacuation Flight above 30 000 ft is a definite hazard

(4) *Post Decompression Syncope*

This is a rare sequel to decompression sickness but probably represents a part of a train of events which has led to death in the rare cases mentioned above The incidence cannot be predicted from the severity of the decompression sickness suffered at altitude and may be followed by a deceptive period of several hours with few symptoms The ætiology is twofold, in

some, persistent neurological and other focal signs demonstrate the possibility of gas emboli persisting at ground level and immediate continued compression to more than one atmosphere absolute is indicated. It cannot be denied that the physical and physiological arguments for the persistence of bubbles at ground level are complex and not proven, but continued compression may resolve focal symptoms and should be given a therapeutic trial. In others much more diffuse symptoms of severe peripheral shock and cerebral oedema develop. These effects could be the result of widespread tissue damage suggested by Masland (1943). In a study of 9 fatal cases of decompression sickness Haymaker and Johnson (1955) found systemic fat emboli in 6, and went on to deduce that this finding meant cellular disruption, probably in the bone marrow, with the release of lipases, potassium ions, peptides and histamine-like substances into the circulation. A parallel could be drawn between the "crush syndrome" and its delayed effects due to muscle and tissue damage and this intracellular "burst syndrome." In one subject who suffered from post decompression collapse a raised serum potassium level was found (Fryer, 1956). If a case occurs following flight, treatment should be instituted immediately along the following lines:

(i) Where there are persistent focal signs a trial of further compression should be given.
(ii) Where shock predominates, treatment of peripheral vascular failure may include oxygen, I.V. fluids, noradrenalin and adrenal corticoids.
(iii) Pulmonary complications may also require oxygen and the tapping of effusions.
(iv) Restlessness and cerebral oedema may develop and the treatment has been well summarized by Argent and Cope (1956).
(v) Anxiety, an understandable feature, may require sedation.

These symptoms appear with such rapidity, and are cleared by immediate descent in the majority, that categorization is a matter of judgment on the part of the observer who must be in attendance throughout the run. Comparison with other similar series carried out by Cotes and Gronow (1952) and Roxburgh (1953) is difficult owing to different interpretation of the symptoms but the general incidence is the same, the distribution and time of onset of the different groups can be seen in fig. 1. This distribution has remained remarkably constant over the seven years of testing.

DISCUSSION

From a study of this selection test on well over a thousand air crew it is surprising how difficult it is to find definite predisposing constitutional factors determining susceptibility. Age is probably the most definite but even here, with the relatively few numbers tested over 35 years old, there is no rapid rise of susceptibility with age. In fig. 2 the normal air crew age distribution for the first two categories is shown against those who have suffered severe symptoms in the test, while in fig. 3 the increasing percentage of category C's

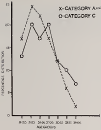


FIG 2—Showing the incidence of the three categories against the age group distribution

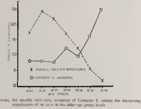


FIG 3—Showing the steadily increasing incidence of Category C among the decreasing populations of air crew at the older age group levels

of the few tested in the older age groups is seen In the younger age groups the incidence is less while after 27 there is an increasing incidence shown by the two lines diverging Owing to the small numbers in these latter age groups applying the χ^2 test reveals that such a tendency might appear by chance more often than 1 in 20 trials a conclusion already reached by Samuel (1955) reviewing a larger number of tests in the Royal Air Force

Another well-known association is between body weight and susceptibility, the overweight store more nitrogen and hence have more nitrogen to get rid of into the tissues and circulation at altitude Such an argument is too facile, as shown in Table I where 69 air crew in each category were picked out from

TABLE I.—TO SHOW THE RELATIVE INCIDENCE OF AIR CREW WHO WERE 1 STONE OVERWEIGHT (UNCLOTHED) IN THE AGE AND CATEGORY GROUPS

Age group	*Categories* A	B	C
18–21	15%	15%	8%
22–25	13%	35%	22%
26–29	54%	30%	61%
30–33	9%	25%	25%
34–37	50%	37%	20%
Average totals	28%	28%	28%

TABLE II.—TO SHOW THE INCIDENCE OF SYMPTOMS AND SCATTER, ACROSS THE THREE EXPOSURES TO ALTITUDE

	Overall incidence	*Run incidence* 1	2	3		
Category B	32%	51%	30%	19%	Limb bends	87 9%
					Abdominal gas	12 1%
Category C	9%	57%	23%	20%	Chokes	42%
					Syncope	31 5%
					Severe acute bends	13%
					Abdominal gas	6·5%
					Post decompression collapse	3 5%
					Persistent tissue damage	3 5%

the same year periods and arranged according to their weight The expected weight for age and height has been calculated from tables prepared by Morant (1946) for air crew As can be seen no matter which age group is taken there is approximately the same number overweight in each category, the totals bear this out Overweight, in itself, may not mean excessive fat and an increase in body fat supplemented by an increased rate of nitrogen excretion, may render the fat subject no more prone to develop decompression sickness than his thin colleague Another aspect is that fat stored in vital organs such as the liver and bone-marrow may be potentially more dangerous than fat stored under the skin Age overweight and nitrogen elimination rates taken singly do not show striking correlations with susceptibility, but together may show an increased correlation Gray (1951) has shown that

TABLE III —TO SHOW THE SURFACE AREA/BODY WEIGHT RATIOS BETWEEN CATEGORIES A AND C THE SIGNIFICANT DIFFERENCE BETWEEN THE MEANS CAN ALSO BE SEEN

Surface Area/Body Weight × 10^4	*Category A*	*Category C*
>118	76%	30%
<118	14%	70%
Mean	121	115
Standard deviation	±6 5	±6 3
Difference between the means	6	
Standard error of the difference	0 78	

surface area/body weight ratio may show a more significant correlation than weight alone This is borne out by our data as well In Table III the percentage of air crew falling above or below a ratio of 0 0118 has been chosen from a consideration of the standard deviation of over 200 in category A a striking difference can be seen which would be even greater if age were also taken into account That this difference in the mean values is significant is demonstrated by the low value of the standard error of the difference However it is still a continuous variation and cannot be used to predict which category a particular subject will fall into

Thus in selecting air crew particularly suitable for high altitude, the age body surface/weight ratio and uncomplicated runs to altitude in a decompression chamber should all be taken into account Owing to the number of unknown variables affecting an individual's susceptibility to decompression sickness a series of objections can be raised to the latter consideration which some would overrule in favour of those with more experience and airmanship If the test were a mere random distribution for a particular air-crew population each exposure over a large enough series should pick out an equal number of susceptibles That this is not so is seen in Table II where a steadily decreasing incidence for both category B and C is seen over the week Again if it were a random procedure re test results after four years should bear no relationship to previous categorization Over 70 have been re-tested and, with a normal expression rate, at least 6 category C s should have appeared Disregarding the increased incidence with age only one has done so In this case a pilot-engineer aged 33 with about five hours experience flying unpressurized above 25,000 ft and a category A four years previously developed bends at 30 minutes but opted to stay in the chamber the bends easing for a time At 45 minutes he felt unwell and dizzy and was removed to ground level without losing consciousness How much the mild but prolonged bends pain contributed to his syncope is difficult to estimate Another pilot, aged 30 with no experience of flying above 30 000 ft unpressurized, and a history of several syncopal attacks following injuries and injections, was passed category A in 1953 Sixteen months later he became unconscious while flying following a severe attack of bends at 37,000 ft He recovered consciousness and control of the aircraft at 15 000 feet He was re-tested and on the second run had severe elbow bends after 27 minutes at altitude Three minutes later he

collapsed in the chamber but quickly regained consciousness at 28,000 ft with no sequelæ at ground level This illustrates the occasional subject who slips through the net, tends to fight against bends pains, precipitating a syncopal attack to which he was prone, and also that the whole sequence can be simulated in the decompression chamber As a high proportion retain their category following re-testing and in flight it seems a fair conclusion that those categorized C will do the same Until the factors affecting susceptibility are fully known a heavy responsibility rests on anyone allowing such a subject to fly high however remote the chance of recurrence

Summary

The nature of aviators' decompression sickness is discussed with reference to those symptoms developed during the regular High Altitude Selection Test The importance of constant observation during the test, and afterwards, in any subjects who have suffered severe symptoms is stressed Factors influencing susceptibility are shown to be multiple and the general impression is confirmed that those who are under 27 years of age, not overweight, with a normal body fat distribution, are less susceptible The High Altitude Selection Test is shown to be of value, not only in the pre-selection, but also in the indoctrination of air crew into the signs of decompression sickness without which mild symptoms might be dismissed with serious results It cannot be denied that the statistical evidence is slender, but as in all questions of preventative medicine, the wisdom of measures taken are only revealed over a long period of time

Acknowledgments

I wish to acknowledge my debt to the staff of the Royal Naval Air Medical School for their accurate documentation, help and encouragement and to Squadron Leader D Fryer, Royal Air Force Institute of Aviation Medicine, Farnborough, for his criticisms and suggestions

References

Full use has been made of Professor J F Fulton's symposium on Decompression Sickness compiled by the Aviation Medicine Division of Medical Sciences of the National Research Council Washington, D C. W B Sanders and Co Philadelphia and London 1951 for the following references

Ferris, E B Jnr and Engel, G L (1951) Chapter 2, page 37
Gray, J S (1951) Chapter 7 page 190
Henry F M, and Ivy A C (1951) Chapter 10
Tobias, C A (1951) Chapter 11

Journals and Reports

Argent D E and Cope D H P (1956) *Brit med J* **1**, 593
Barcroft J Douglas C G, Kendal, L P, and Margaria, R (1931) *Arch Sci biol*, Naples, 16 609
Behnke, A R (1955) *Milit Med* **117**, 257
Boothby, W M, and Lovelace W R (1938) *J Aviat Med*, 9, 172.

COTES J E and GRONOW D G C (1952) Flying Personnel Research Committee Institute of Aviation Medicine Farnborough Report No 795
FLECKINGER D EVEREST F K CROSSFIELD S, DE HAVEN, B, MURRAY A, RAHN B and ROGERS, D (1955) *J Aviat Med* 26 509
FRYER D (1956) Sqd Ldr R A F I A M Farnborough Hants personal communication
HALL A L SHRINEGESH, M M and JOHNSON M N (1953) U S Naval School of Aviation Medicine, Pensacola Florida Project Report No NM 001 059 21
HAYMAKER, W and JOHNSON A D (1955) *Milit Med* 117 285
—— —— and DOWNEY V M (1956) *J Aviat Med* February
HENDERSON Y (1917) Effects of Altitude on Aviators Aviation 2 145–147
MASLAND R L (1943) U S A F School of Aviation Medicine Project No 217 Report No 1 30 Dec 1943
MASON K (1957) Wing Cdr R A F Institute of Pathology Halton Bucks personal communication
MORANT G M (1946) Flying Personnel Research Committee I A M Farnborough, Report No 653
ROXBURGH H L (1953) *Med Press*, **229**, 1
SAMUEL G D (1955) Flying Personnel Research Committee I A M Farnborough Report No 653
SHEDAL, H A (1948) U S Naval School of Aviation Medicine Pensacola Fla Project No NM 001 017 (X-762) Report No 3

THE CHRISTMAS ISLAND STORY

BY

Acting Surgeon Commander P D G PUGH, R N

I was appointed to H M S *Warrior* in mid August 1956, and it has seemed to me that the events which followed my appointment should be recorded not because I have anything dramatic to report from the medical angle not because I have fathomed the secret of the hydrogen bomb but simply because I feel that a brief account of some of the things we saw, and some of the things we felt and did during the enactment of this historic event may be of interest to the reader I must make it clear that this operation *Operation Grapple'* was so vast and complex an affair that no one person saw the same picture The "Grapple" crest consisting as it does of a Cormorant (a land air and water bird, and the emblem of Combined Operations) perched on a grapnel the four claws of which signify the Army Navy Air Force and A W R E (the Atomic Weapons Research Establishment which is situated at Aldermaston) makes this point My account must by the very nature of things contain a naval bias and I make no apologies for this but acknowledge right at the start that the other three claws each played just as important a part as the Royal Navy

Early in June 1956 Sir Anthony Eden announced in Parliament that Great Britain intended to hold a trial of Megaton weapons from a base situated at Christmas Island in the Spring of 1957 The Task Force Commander was to be Air Vice-Marshal W E Oulton *C B E D S O D F C* From the naval angle a "Grapple Squadron was to be formed under the command of Commodore P W Gretton *D S O* and two bars *O B E D S C*, R N who was also to be the Deputy Task Force Commander During the Summer and Autumn of 1956 the planning went ahead and a start was made on the construction work at Christmas Island The vessel chosen to be Flagship to the Grapple" Squadron was H M S *Warrior* whose Commanding Office was Captain R B N Hicks *D S O* R N

My appointment to *Warrior* in mid August was cancelled because of the Suez crisis but I eventually joined her towards the end of September The assistant medical officer Surgeon Lieutenant R W Davidson, R N had joined a few weeks previously

I do not propose to delve too deeply into the events which preceded our departure from the United Kingdom It was a particularly busy period As *Warrior* was to be in the forward area I had to consider the procedures and investigations to be carried out in the highly unlikely event of casualties

being incurred In this connexion visits were paid to the R N Medical School and the A W R E at Aldermaston where I discussed these matters with Doctor Lynch, the Principal Medical Officer and other officers of the Establishment From all I received the utmost co-operation and most helpful advice I also visited Harwell where I first made the acquaintance of Air Commodore Wilson, the personal adviser to the Task Force Commander on matters relating to radiation and his assistant, Squadron Leader Sturrock

As a result of these discussions proposals were drafted and finally approved to standardize throughout the squadron both the investigations and treatment of any casualties As so little is known about radiation injuries stress was laid on the importance of keeping a detailed record of such patients and ideal investigations were listed It was clear however that the circumstances could be such that only a limited number of these procedures could be carried out In such an event a daily blood smear and urine collection (for forwarding to A W R E) were selected as the most valuable and simple of the available investigations Facilities for coloured clinical photography were also made available aboard *Warrior*

A routine for the treatment of radiation injuries thermal burns and mechanical trauma was laid down it being proposed to deal with all major trauma in the operating theatre in *Warrior* Additional apparatus and drugs were obtained but it seemed pointless to order more material than the available staff would be able to use It was not therefore the hypothetical number of casualties that dictated the issue but the known number of staff As soon as the plan was laid training in all these matters was instituted

Meanwhile the work at "Christmas" pushed ahead H M S *Messina* had first become associated with Operation "Grapple" in February 1956 when she came out of reserve in Malta and sailed for the United Kingdom to undergo an extensive refit at Chatham (including the installation in the tank deck of a forty tons capacity refrigerator for the storage of fresh provisions at "Christmas") She left the United Kingdom on the 10th June 1956 and crossing the Atlantic via the Azores and Jamaica passed through the Panama Canal reaching Christmas Island on 22nd August There cargo brought from the United Kingdom was transferred ashore and other equipment transferred to Malden Island which was first reached on 3rd October By the time *Warrior* sailed on 2nd February most of the preliminary work in the islands had been completed

OUTWARD BOUND

On our journey out we carried over 100 Army and R A F personnel as passengers We had had many signals of good wishes on leaving Portsmouth amongst which was a particularly thoughtful one from Combrax Portsmouth "*Make sure you reach Christmas Island by Easter and not Easter Island by Christmas*" It was not long however before we had other things to think about for we ran into a storm of almost hurricane proportions which lasted

for five days and nights. At the end of it most of us were utterly exhausted, and the ship itself severely damaged. Part of the bows had been pushed in by the waves to an extent one could hardly credit, and most of the boats had either been badly smashed or swept away. It was therefore with much pleasure that we arrived at Jamaica on the 15th February for a two day break.

Whilst at Jamaica I took the opportunity of calling on Professor J. S. R. Golding, now in charge of the Orthopædic Department of the recently formed University College of the West Indies. During recent years Professor Golding has distinguished himself in two fields. He has made a comprehensive study of the bone changes which occur in sickle cell anæmia, and presented his findings in an Hunterian Lecture delivered to the Royal College of Surgeons in 1956. He also performed a great service to the island during and following the serious outbreak of anterior poliomyelitis which struck the West Indies during 1955. It will be recalled that Mr. Jackson Burrows, Orthopædic Consultant to the Royal Navy, flew out to advise on the measures to be taken at that time. Any Naval medical officers who happen to be this way should certainly visit this interesting clinic.

H.M.S. *Narvik* had departed the United Kingdom a few days before us. She also had struck the storm and had sustained such damage that she was delayed for several days in Jamaica for repairs.

Leaving Kingston on the seventeenth, *Warrior* passed through Panama on the nineteenth. It was a fascinating experience. We were honoured by the presence of Her Majesty's Ambassador to Panama who took passage through the canal with us. At times, as we entered the Gatun Locks, there were literally only two or three inches clearance on either side. Yet such was the dexterity and competence of the pilots that the passage through the canal was made in about ten hours. After a short stop at Balboa to refuel, we sailed that evening for Christmas Island.

Next day we ran into quantities of turtles, all apparently making towards the coast. It was an opportunity too good to miss. Our ships flight consisted of three Avengers and four Whirlwind helicopters. At the time the Avengers were flying, and the planeguard helicopter was airborne. Accordingly the Sproule net was lowered and after one or two attempts a turtle of about two hundred pounds was scooped out of the drink. Thus it came about that my first operation aboard (performed with a Syme's amputation knife) was a *D.O.T.* or rather a *D.O.D.* being performed on one of the sponsons. The following evening turtle soup was served in the Wardroom.

The next day we passed *Cocos Island*. Owned by Costa Rica, Cocos is about 14 miles by 4½ miles in extent, and extremely mountainous. During the seventeenth century it was the resort of buccaneers, and is reputedly the hiding place of fabulous treasure. During the last century, whaling vessels frequently watered there, but now it is uninhabited, save for the Costa Rican Government agent. This was our last sight of land, prior to our arrival at "Christmas."

Fig. 1 —The versatile Sproule Net On. di ... out from Panama

A few days out from "Christmas" the first case of appendicitis occurred and allowed us formally to open the *proper* operating theatre

Christmas Island

We arrived at Christmas Island on the morning of the 4th February and anchored off Cook Island which lies at the mouth of the lagoon Christmas Island is one of a line of small low desolate islands (the *Line Islands*) which runs S S E from the Hawaiian Group to the northern part of French Oceania Passing from north to south these islands are Kingman (*U S*), Palmyra (*U S*), Washington (*Brit*) Fanning (*Brit*) Christmas (*Brit*) Jarvis (*U S*), Malden (*Brit*) Starbuck (*Brit*) Caroline (*Brit*) Vostock (*Brit*) and Flint (*Brit*)

These coral atolls for the most part uninhabited and semi-barren, were unoccupied until after 1930, being occupied only by guano seekers or small planting companies which established coconut plantations in some of the more accessible places After 1930 when it was seen that what had hitherto appeared useless islands might provide valuable airstrips there was a scramble by British and American interests for formal possession of the various atolls comprising the group

A coral atoll is a more or less circular reef descending steeply into the sea on one side and shoaling away into the lagoon on the other. The reef encloses a calm lagoon usually shallow but some have deep parts, where large ships can anchor. They are famous for their beautiful colours, but they are without fauna without soil which will grow fruit and vegetables usually found in the tropics and without running water. An atoll is probably a mountain the top of which has been flattened to below the surface by powerful ocean waves thus providing a suitable site for coral polyps and algae to develop and build the coral islands. Emerging permanently from the ocean surface the coral dies. Sand shells and debris are piled up by the waves forming a strip of dry land which consequently is almost always higher on the windward side.

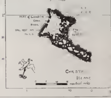


Fig. 2

Christmas Island lies in the equatorial Pacific about 1,200 miles south of Hawaii at 2° N latitude 157° W longitude. Roughly resembling a large lobster claw in outline it forms the largest atoll in the Pacific with a perimeter of 105 miles. It is about 35 miles in length in a north-west to south-west direction, and about 17 miles in width. Enclosed within the outer coast is an area estimated at 382 square miles of which approximately 250 are land and 107 are lagoon, about 25 square miles are occupied by numerous salt

like. Viewed from the air, the lakes and lagoon present an unforgettable picture. The colours have to be seen to be believed. Apart from the various shades of blue and green there are large tracts of red, rust and mauve and violet hues due to various forms of algae. These colours are arranged in an arresting manner as a result of the grotesque shapes of the lakes and the whole combines to form a modernistic picture which would do credit even to Picasso. The island is generally low, averaging about ten feet or less in elevation except along the southern shore of the Bay of Wrecks where there are scattered sand dunes which may reach 40 feet in height. The rainfall varies from 10 to 300 inches a year. The air temperature varies from a minimum of 68° F to a maximum of 106 F but the Easterly Trade Winds exert a cooling influence so that despite the high humidity, the heat is not oppressive.

On the afternoon of 24th December, 1777, Captain Cook brought the *Resolution* and the *Discovery* to anchor off the west shore of the island. This was Cook's third voyage of discovery and he was journeying north in search of the north west passage. The following account of his discovery was recorded by Cook.

> 1777 *December Wednesday 24th*. On the 24th about half an hour after daybreak, land was discovered bearing North East by East half East. Upon a nearer approach it was found to be one of those low islands so common in this ocean, that is a narrow bank of land enclosing the sea within.
>
> *Thursday 25th*. At daybreak the next morning, I sent two boats one from each ship to search more accurately for a landing place and at the same time two others to fish at a grappling near the shore.
>
> *Sunday 28th*. On the 28th I landed in company with Mr Bayly on the island (now known as *Cook Island*) which lies between the two channels into the lagoon to prepare the telescopes for observing the approaching eclipse of the sun which was one great inducement to my anchoring here.
>
> *Tuesday 30th*. On the morning of the 30th the day when the eclipse was to happen Mr King, Mr Bayly and myself went ashore on the small island above mentioned to attend the observation.
>
> *Wednesday 31st*. Having some cocoa nuts and yams on board in a state of vegetation I ordered them to be planted on the little island where we had observed the eclipse and some melon seeds were sown in another place. I also left, on the little island a bottle containing this inscription
>
> *Georgius Tertius Rex 31 Decembris 1777*
>
> *Naves Resolution Jac Cook Pr*
>
> *Discovery Car Clerke Pr*
>
> As we kept our Christmas here I called this discovery *Christmas Island*.

The vessels stayed at anchor several days to permit the men to refresh themselves. Cook reports that there were no traces of human beings having been there before and that the number of coconut trees did not exceed thirty. However it has been said, although we saw none, that numerous archaeological sites suggest that the island had been visited previously—possibly by Polynesian castaways and natives in search of more fertile lands. Cook had the following to say about the animal life

> Under the low trees above mentioned sat infinite numbers of a new species of tern or egg bird These are black above and white below with a white arch in the forehead (apparently sooty terns) and are rather larger than the common noddy Most of them have lately hatched their young which lay under old ones upon the bare ground The rest had eggs of which they lay only one larger than that of a pigeon bluish and speckled with black. There are also a good many common boobies a sort that are almost like a gannet (most likely the blue faced booby) and a sooty or chocolate coloured one with a white belly (the brown booby)

To this list can be added men-of-war birds tropic birds, curlews sand pipers a small land bird like a hedge sparrow (the *kokikokiko*, as named by the Gilbertese) land crabs small lizards and rats

Apart from shipwrecked crews (the eastern coast forms a deep bay aptly called the Bay of Wrecks the shore of which is still strewn with wreckage), the island appears to have remained unoccupied for more than forty years after Cook's landing Later British and American whalers began occasionally to touch at the island in order to rest their crews and load their vessels with sea birds eggs

The whaling ship *Tuscan* stopped at Christmas Island in May 1835 Bennett (1840) gives an interesting account of the visit and states that "Here and there among the low thicket scrubs are vast rookeries of aquatic birds whose clamour is deafening" He recorded that he was able to make his way round more than two thirds of its coast " He also reported that the island was uninhabited and that the yams, melons and coconuts planted by Cook and the bottle and inscription left to commemorate his discovery had all disappeared The island must have been visited fairly recently, for he found that "more than fifty" of the coconut palms had been "laid prostrate by fire and axe—the mischievous work of some visitors who left their names engraved on the trunks of the surviving trees"

In 1888 Captain Sir W Wiseman of H M S *Caroline* formally took possession of the island on behalf of Her Majesty, Queen Victoria

In 1902 a British lease was granted to *Lever s Pacific Plantations Limited* who planted some 70 000 coconut trees before deciding to abandon the island In 1913 a London firm *Central Coconut Plantations Limited* acquired the lease from Lever Bros The Managing Director M l'Abbe Emanuel Rougier was responsible for many of the extensive coconut groves that now occupy the north-western northern, south-western and southern parts of the island The Holy Father must certainly have had his tongue in his cheek when he christened points on opposite sides of the lagoon *London* and *Paris* for it is he who is reputed to have first mapped the island

During the late war an American Task Force occupied Christmas Island from November 1942 to March 1946 At one time there were as many as 10 000 men on the island They constructed the airfield and various buildings, remnants of which remained at the time of the arrival of our survey party They also dredged the channel to the north of Cook Island

The Colonial Office bought out Rougier's nephew when he returned to

claim the island after the last war for £50 000 He was not popular and he threw in his lot with the Vichy Government

The island forms part of the biggest colony in the world (about two million square miles) the Gilbert and Ellice Islands But most of the colony is sea and Christmas Island forms two thirds of the land area About 150 Gilbertese have been brought in to provide a labour force for the plantation The natives occupy a village near the Port of London and here too is the residency of the district officer Mr Percival Roberts The island is administered as far as that goes from Tarawa 1 800 miles away

It was towards the end of 1955 that the first survey party arrived by air at the island with the object of determining whether or not it was suitable to be used as a base for the megaton tests They found the airfield was still in a fairly reasonable condition, and a few of the buildings in its vicinity still intact The Port of London too, seemed suitable as a site for off-loading As a result of their favourable report the island was finally selected

In June 1956 the first advanced parties arrived and from that time a rapid build-up took place A fantastic task lay ahead but the work progressed with only minor hitches Both the Army, Navy and Air Force were in at the start It is clear that I cannot go too deeply into what was involved excepting to say that the anchorage for the Port of London had to be prepared and the Port itself set up Miles of roads were made A job in itself was the Main Camp situated twelve miles from the Port, and beyond this was the airfield which also required a considerable amount of labour Up to November 1956 over 20 000 tons of cargo including some 600 vehicles and cranes tractors bulldozers, graders cement-mixers and so on were transported to the area The task of off-loading the gear and stores necessary for such an operation was a gigantic one By the time *Warrior* arrived the Port Camp the Main Camp and the Airfield were virtually fully operational and ready for the tasks that lay ahead

The Senior Medical Officer for the island Squadron Leader Bradley came aboard shortly after our arrival One of the first to arrive at the island, he had watched the entire evolution of the project and so, when we landed later could give an almost fatherly account of everything we saw

The Port Camp was mostly tented with a small proportion of wooden buildings It was occupied by R N and R M personnel together with a sprinkling of the Army Their responsibilities were mainly off-loading and back-loading and the maintenance of the small craft used for this purpose There was a small M I Room staffed by a R A F medical assistant

The native village near by consisted in the main of attap huts (thatched buildings) The Gilbertese are Micronesians darker and less attractive than the Polynesians Educationally they are far less advanced, very few can understand English and their craftsmanship is far inferior to the Polynesians Nevertheless they are a happy people, perpetually smiling and having a particular delight in showing off their babies These run around stark naked and are remarkably healthy The men are usually reasonably dressed in

European clothes, but the women wear ill fitting, poor quality dresses that make them look more ugly than they already are. Occasionally one sees a young girl wearing a grass skirt over her European clothes, but these skirts too compare unfavourably with similar articles made by Polynesians. The medical care of the village was, until shortly before our arrival, in the hands of a Fijian assistant medical practitioner, Simeona Peni. Following his departure to another island, Squadron Leader Bradley had taken over. During the ensuing weeks Naval medical officers looked after the M.I. Room in the Port Camp and attended the Dispensary in the native village. There was an official Post Office in the village, an agency of the Gilbert and Ellice Colony, which sold Gilbert and Ellice Island stamps, and curios made by the natives. Most of the natives, who had previously been employed on the plantation, were now employed in a labouring capacity for the "Grapple" Operation.

The road from the village to the Main Camp runs through virtually continuous coconut plantations, the journey taking about twenty five minutes in a Land Rover. At the Main Camp were situated, among other things, two messes for senior and junior officers (the scientists shared these messes), their tents, and close by, the hospital.

The hospital (which was really a large sick quarters) was partly of wooden construction and partly tented. About one hundred patients could be accommodated although there were rarely more than a dozen or so. There was an operating theatre, X-ray room, laboratory and dental surgery. Squadron Leader Bradley's assistant was Flight Lieutenant Conehie; other medical personnel included one operating room technician, one radiographer, one laboratory technician, one sergeant medical administration and over ten nursing attendants. In addition to his responsibilities at the hospital the Senior Medical Officer was responsible for the M.I. Rooms at the airfield, the Port Camp, Malden and Penrhyn, although soon after our arrival we took over responsibility for the Port Camp and Malden.

On 5th March, we heard with regret that Commodore Gretton, who had already played so valuable a part in the operation, was unable to join us owing to sickness, but were delighted to learn that our Captain had been appointed Commodore of the "Grapple" Squadron in his stead.

Our initial visit to Christmas Island only lasted six days, and during that time much hard work was done in order to complete the oil loading of the large quantity of stores and equipment which we had brought out with us from the United Kingdom. On the 10th March we sailed with about 300 Army, R.A.F. and R.M. personnel aboard, for Honolulu. The object was to give a break to these men, many of whom had been on Christmas Island for up to nine months.

Honolulu

We arrived at Honolulu, Oahu Island, on the morning of the 13th March and docked at the Army port, being the first aircraft carrier and one of the largest ships ever to do so.

One cannot help but recall the arrival of Captain Cook on the 20th January, 1778 at these Islands which he named the Sandwich Islands He likewise had sailed up from Christmas Island and it is now accepted that he was the first European to set eyes upon the island group His landfall was made at the island of Atooi (Kauai)

> The next morning we stood in for the land and were met with several canoes filled with people some of them took courage and ventured on board In the course of my several voyages I have never before met with the natives of any place so astonished as these people were on entering a ship Their eyes continually flying from object to object the wildness of their looks and gestures fully expressing their ignorance about everything they saw and strongly marking to us that until now they had never been visited by Europeans"

FIG 3 —*Warrior* [illegible] meets *Honolulu* [illegible]—March 1957

Ours was a no less exciting greeting but rather different We were met by a forty-piece American Army band and by a troup of Hula-Hula girls in traditional costume who sang and danced for us on the jetty and then came aboard and did a repeat performance on the flight deck placing a leis (garland of flowers) around the neck of both the Commodore and the Commander

During the forenoon the Navy laid on a trip around Pearl Harbour and

we saw the sites where the eight American battleships had foundered during the surprise Japanese attack in 1941. Hawaii made contact with actual war on only one day—"the day of infamy"—7th December, 1941. But the events of that day altered the course of human history. All but two of the hulks have been raised, some in fact were raised so rapidly that they saw further service during the war. One of the remaining hulks, the *Nevada*, is still in commission for as our guide put it "She is still manned by her Captain and eleven hundred men." Above the surface little remains except a few pieces of twisted and rusted steel over which the Stars and Stripes is raised each day and on which a small memorial has been erected. Following this tour, we were entertained by the Navy to a most delightful lunch, the main dish of which was dolphin.

That evening *Warrior* gave a cocktail party to four hundred guests. We thought it a success and I believe our guests did too. "Reminiscent of the gayer moments of military life" wrote the *Honolulu Advertiser* "was the delightful reception held Wednesday aboard the aircraft carrier H.M.S. *Warrior*. Guests were transported on the airplane lift to the after flight deck where the reception was held. The area was decorated with coloured banners and flags. An inflated rubber life raft, fixed with a shower head run by an electric motor, made a gaily splashing fountain. At one end two hot-dog stands served the American delicacy to guests. The deck of the ship was laid with rugs and decorated with potted palms, banana leaves and orchids——"

The Tripler Army hospital is a fine modern hospital most lavishly equipped with the latest of everything. The VIP suite had to be seen to be believed. Although I have never been privileged to see inside a palace, I cannot bring myself to imagine that there can be much difference. It was completed during the Korean war and is the latest and amongst the finest of all U.S. Army hospitals. I was given a most cordial reception, and no effort was spared to show me anything I wished to see. This hospital was the nearest hospital to Christmas Island although 1,100 miles away, and was the hospital to which patients beyond the scope of the facilities at Christmas Island were discharged. In addition they kindly undertook certain pathological and other investigations for us and supplied urgent medical requirements.

The main industries of the islands are pineapples, sugar and the tourist trade. Many of us toured Libby's pineapple factory, near which we tied up, and were much intrigued by what we saw. The hospitality extended to us was of the most generous kind. Trips were organized round the island, which is mountainous, and very beautiful, and to the famous bathing beach at Waikiki sands. All our passengers thoroughly enjoyed their stay. There was no drunkenness, no venereal disease, and no fighting. Whether all this was a measure of how much good nine months' stay at Christmas Island had done them, or how little the dollar will buy, I leave it to the reader to judge. At all events, it was with a feeling of sadness that we sailed from Oahu Island on the afternoon of the 15th to return to Christmas Island and the tasks that lay ahead.

More About Christmas Island

We arrived back at Christmas Island on the 19th March and the ship remained there until the end of the month. I can say little about the work that went ahead during this time, but I would like to say something about the facilities for the general well being and recreation of personnel engaged on this project.

Without doubt many lessons had been learnt as the result of the previous tests at Monte Bello, Woomera and Maralinga, but the tremendous magnitude of this operation (for the size of the operation would appear to the casual observer to grow proportionately to the size of the bomb) together with the remoteness of the island must have made the task of trying to make life reasonable for the personnel engaged a heavy one.

As at Monte Bello, so here, tremendous emphasis was laid on mail. There were always three outgoing and three incoming mails each week, and on an average a letter took about six days either way, not infrequently only four, which means, of course, that it was averaging well over a hundred miles per hour from the moment it was popped into the letter box. For morale purposes the Army Field Post Office franked outgoing envelopes with the words "B F P O Christmas Island". It is, I understand, almost unique to indicate on the envelope the site of the Field Post Office. Specially designed commemoration covers were also issued to celebrate the successful detonation of the first weapon.

Food always comes next in a discussion of this sort. It was quite remarkable to have a fresh crisp lettuce of excellent quality, with radishes, spring onions, celery, etc., on the menu almost every day. Fresh fruit, in particular pineapples, oranges and apples were served at least three times a week, frequently daily. Not only do my remarks apply to the wardroom in *Warrior*, but also to what was consumed on the mess decks, and in the other ships of the squadron. Ashore, the food was of not such a high standard, but it was rather its method of presentation which led to criticism than its quality. This happy state of affairs aboard was in the main brought about by the regular transport flights from Honolulu, and the provision made in certain ships of the squadron to stow large quantities of perishable foodstuffs.

All this is, however, no new thing. In his journal at the conclusion of his second voyage of discovery, Cook remarks that only one man was lost by sickness, and goes on to say "*Extraordinary attention was paid by the Admiralty in causing such articles to be put on board us from either experience or suggestion it was judged would tend to preserve the health of the seamen.*" He goes on to list "Malt, of which was made sweet wort, sauerkraut, portable broth, and rob of lemon and orange." He also took aboard "Sugar in the room of oil, and wheat for part of our oatmeal." Sugar was considered to be an antiscorbutic and fat to promote scurvy.

It was twenty-five minutes' journey to the Port of London by motor cutter and this undoubtedly deterred many from going ashore. Onboard entertainments included at least two cinema shows a week, tombola and similar games

Deck [illegible] extraordinarily popular and produced [illegible] minor injuries. As regards swimming, three magnificent inflatable rubber swimming pools were purchased specially for the operation at a cost of £280 apiece. While they lasted they were a source of much pleasure, but they barely survived a month and thereafter only the rather inferior canvas baths remained. Pre-wetting is an excellent method of both cooling down the ship and providing a very pleasant shower. We could have used it more often for this purpose. Whilst on the subject of cooling down this type of vessel I must stress the value of coconut matting laid on the flight deck and drenched in sea water. This simple and inexpensive method frequently brought the temperature in my cabin down from just above a hundred to the low nineties; in fact it can make the difference between unbearable and just bearable. But coconut matting and pre-wetting are not the final answer to the inescapable fact that this class of ship is utterly unsuited to the tropics in its present form, at any rate from the point of view of the officers' accommodation, which, situated as it is on two deck aft, reaps the whole fury of the sun blazing down on the flight deck.

Fishing was a popular pastime, and although few really large fish were landed, vast quantities of very respectable ones were dragged aboard. The huge manta rays never seemed to take even the most attractive of baits. One famous day about a dozen were seen browsing round the ship on the surface of the water. In desperation a Bren gun was turned on them and at least four were accounted for, but long before anything could be done about retrieving the corpses they rolled over on their backs and disappeared into the depths. This led to a rage for pistol practice at fish called awa, which run from about ten to twenty pounds. They give the most excellent sport, often taking over half an hour to land with a light rod. They feed just on the surface. To shoot one with a pistol was extraordinarily difficult to do. I saw one direct hit, but this fish, too, sank before it could be retrieved. When it became apparent that you could not land your game, interest in the "sport" flagged. A veterinary legal question now arises. Why does a shot-fish sink and a depth-charged fish float?

As regards boxing, one cannot mention it without thinking of our Fijian friends. Forty R.N.V.R. ratings of the Fijian Navy joined us shortly after our arrival for the duration of the operation. Nineteen were put in a mess of their own and the rest were scattered throughout the ship. They seemed to be at home almost immediately and joined in everything that was going with the utmost relish. They are extremely pleasant people and the hardest of workers. Two of them were S.B.A.s and proved a great asset in the Sick Bay. Shortly after they arrived a boxing competition was held. All forty immediately wanted to fight, regardless of weight; nine stone men were challenging twelve stone men, and so forth. It was with extreme difficulty that the sports officer was able to select a suitable pair, and these were put on at the end of the show. How these boys enjoyed fighting! The harder they were hit the more they laughed, and they immediately won both the respect

and friendship of their messmates Badminton and volley ball were also played

Ashore, there were football pitches hockey pitches cricket pitches and even a running track By and large the surface was poor and at times after heavy rains waterlogged Nevertheless many matches were played after which the players could repair to the canteens and drink beer from cans stamped "Specially canned for the Megaton Trials" and embossed with the Grapple insignia

For ornithologists the island provided a dream come true The bird life was quite remarkable and the birds so tame that it was literally possible to pick one off her nest place her on the ground beside the nest photograph her and then replace her There were many sanctuaries where the birds particularly congregated One of these was Cook Island which not only provided excellent bird-watching but also very pleasant swimming, and another the Island of Motu Tabu The British District Officer, Mr Percival Roberts very kindly took some of us for an afternoon trip to this islet Whilst some fished or collected shells—another popular pastime—and others swam the more bird-minded were able to secure some remarkable photographs of the bird life which included the white tern (in my opinion the most beautiful of all the birds on the island being almost waxen in appearance and fluttering around with a motion akin to that of a butterfly) the Christmas shearwater the white capped noddy and several varieties of boobies

Barbecues were a popular feature and were often combined with cray fishing expeditions For the latter it certainly required low water whilst some said a full moon and others a dark night Armed with stout gloves and equipped with lanterns the crayfishers patrolled that area between the reef and the shore sweeping backwards and forwards in a line When the wily cray was sighted all that had to be done was to pick him out of the water This of course is far easier said than done and rarely were more than half a dozen brought back although the old inhabitants spoke glibly of picking up as many as one a minute in an hour's fishing One officer equipped himself with a forked stick the object being to stick the fork across the body of the cray so that he could neither move fore nor aft He had seen such a method used in Ceylon but it did not have much success at 'Christmas' This brings me to the subject of *fizgigs*[1] a naval store item of which few of us had heard It is a most valuable weapon being a metal trident to which a long wooden handle is attached Each prong of the trident is barbed so that it may be plunged into a fish for instance from a small boat or the gang-way The fish makes off with the metal part which had previously been attached to a line Quite a number of fish were caught that way Alternatively it may also be used for catching crays and stabbing fish in shallow water Never having heard the word used before I was intrigued to read Captain Cook's description of Botany Bay which was originally called Sting-

[1]Although one of the meanings given in the Oxford Dictionary is a "giddy flirtatious young woman"

ray Harbour They catch other sorts of fish, some of which we found roasting on the fire the first time we landed some of these they strike with gigs and others they catch with hook and line'

Some of the more energetic midshipmen had much success with a Seine net Sailing proved a popular pastime, but the waters around the island are extremely dangerous and narrow escapes occurred on at least two occasions Along the reef underwater swimming was also much indulged in As can be imagined many very beautiful and exotic fish were to be observed There were several places where quite good swimming was available and water polo nets were set up and several matches played In many respects Christmas Island is similar to the Monte Bellos in particular the amusements are there if one can be bothered to go and look for them It cannot, however, be said that we found or even sought the type of amusement that Captain Cook's officers indulged in on the afternoon of 23rd November, 1773 at New Zealand[1]

> In the afternoon some of the officers went on shore to amuse themselves among the natives where they saw the head and bowels of a youth, who had lately been killed, lying on the beach and the heart struck on a forked stick which was fixed to the head of one of the largest canoes

There are a few other things worth mentioning We have for instance our old school tie a black tie spattered with white "Grapple" insignia There was also a 'Grapple' news sheet known as the *Mid-Pacific News* It was published about three times a week and provided a pretty comprehensive survey of world events The B B C laid on special "Hello Mum" programmes which were an outstanding success A Christmas party was held for the Christmas Island children which was much enjoyed although I understand they scraped the sugar off the doughnuts because they thought it was sand and smeared the icing from the cake on to their hair because they thought it was Brylcreem A large excavator caused consternation, being mistaken for a giant land crab with which the island abounds Apart from these monstrosities which I was told were delicious to eat the island is singularly free of arthropod and other pests Of mosquitoes, only the Aedes and Culex are believed to occur and aerial spraying kept these well in check Lice (*P capitis*) are abundant on the local population There is a small rat, but no reptiles, apart from lizards, were seen Scorpions cockroaches and ants are all present but not in any quantity

To minister to the welfare of the 5 000 or so personnel engaged in this operation we also had two W V S ladies who rendered the most valuable service Near Paris there was a building constructed a year or two previously by South Pacific Air Lines (S P A L) who had at one time intended to use the site as a refuelling point for their aircraft This building was taken over and used as a rest centre during the early days of the operation

Jarvis Island

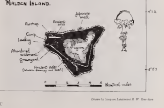
On the evening of 1st April we sailed for the target area (*Malden Island*) which lies about 400 miles to the south of "Christmas" This was the first

of many passages we were to make to this desolate spot We called at Jarvis Island otherwise known as Bunker Volunteer or Brook Island, first reported by Captain Brown of the British ship *Eliza Francis* in 1821 The American Guano Company claimed it in 1857, and from then until 1879, when it was abandoned large quantities of guano were removed Annexed by Britain in 1889 it was leased in 1906 to the Pacific Phosphate Company, but apparently never worked When United States officials occupied and claimed the island in 1935 Britain offered no objection and it has since been used intermittently as an air and weather station

Jarvis island consists of little more than a barren strip of coral about two miles long by a mile wide and is now the site of a Decca station Four men spend a lonely life in a wooden hut and apart from themselves, the hut, wireless masts and thousands of birds there was nothing on the island The birds made it impossible for the R A F to land there and the surf made it difficult for boats Birds however, have a particular aversion to helicopters and it was by this means that we sought to bring in fresh supplies The attempt met with success On the completion of operation "Grapple," the hut was due to be occupied by American scientists doing work in connexion with the Geophysical Year

Malden Island

Next day we arrived off Malden It seems that this island was discovered on 29th July, 1825, by Captain the Rt Hon Lord Byron, of H M S *Blonde*.



Drawn by Surgeon Lieutenant R W Davidson

This vessel had borne to Honolulu the remains of the King and Queen of the Sandwich Islands (Hawaiian Islands), who had died of smallpox while on a visit to England The vessel was homeward bound Lieutenant Malden the survey officer, after whom the island is named, went ashore in a whale boat and explored as much of it as could be explored in the few hours at his disposal He is said to have drawn up a remarkably accurate chart By a coincidence a direct descendant of the lieutenant, bearing the same name was a sapper attached to the 71st Field Squadron This squadron was engaged in the construction work on the island

The journal of the naturalist of H M S *Blonde* (Andrew Bloxam) who accompanied Lieutenant Malden on this visit refers to "immense quantities of sharks around us so ravenous as to bite the oars when the men were pulling' and of clouds of sea birds—'the frigate pelicans were almost sufficient to darken the air with their numbers' He goes on to remark in one spot along the coast I observed what was evidently the work of human hands, though apparently of ancient date, it was a parallelogram of coral stones with stone seven feet high Lieutenant Malden who had walked to another part of the island informed us that he had met with about forty such buildings, but in a more perfect state and extending along the shore in a regular line'

The late Professor MacMillan Brown of New Zealand, made a close study of these mysterious temples which he described as being truncated pyramids with a lower terrace like the tombs of the priest rulers of the Tangon group except that these latter have the blocks that form them carefully chiselled He considered that they were also closely affiliated to the pyramids of the sun and moon on the coastal belts of Peru

A temple sketched by Bloxam is described as being 50 feet long and 25 feet broad, having a breastwork of squared slabs of coral stuck sideways in the ground The space inside had been filled up with coral debris In the middle of the high central square had been erected what had evidently been an altar built dolmenwise of slabs, set up vertically eight feet apart with a flat square slab resting on them, in the case of the temple described this latter had fallen Professor MacMillan Brown added 'the work could not have been accomplished without such surplus wealth and such armies of labour as could not be procured in the present state of the Pacific from all the archipelagos within a radius of several thousand miles ' Mr Karlsen, manager during the turn of the century of the Guano Company that worked the island, told the Professor that beneath and around the dolmens the soil was impregnated with animal matter, as if animal or human bones had been burnt there, thus adding to the idea that they were altars of sacrifice He also said that from most of the pyramid temples paved roads stretched downwards in the direction of the sea but that the terminus of these was in some cases as much as 40 yards from the surf and that this space was rendered almost impassable by the masses of coral debris that covered it The conclusion drawn was that the level of the sea must have changed since the roads were made and that they must have been made centuries before

Because the island, as it stands today, is quite incapable of supporting life the Professor ventured the suggestion that the people who built the temples probably lived on fertile archipelagos within canoe distance of its shores, and that this solitary temple-crowded raised reef must have been their sacred isle: their sacrifices being borne to the altars up from the canoes that had brought them from the surrounding archipelagos. Presumably their island sank, as Tunniki in the Cook Islands is known to have done and whether any of the shipwreckers escaped is one of the great mysteries of the Pacific Ocean.

Others consider this hypothesis to be "highly imaginative" and insist that the stone structures include not only temple platforms but house sites and graves, probably produced by several generations of Polynesians, the total population being unlikely to exceed two hundred. It has been suggested that the island was formerly colonized from Manihiki in the northern Cook group.

A few of the shrines and tracks still exist today although many must have been destroyed by the guano seekers. Some excavation was done but only red dyes were found. A testimony to their sound construction is that most of those remaining withstood the fury of the blast of the megaton weapons exploded high overhead.

An American Captain George E. Nichter is said to have landed in 1842. The island is rich in deposits of phosphate which is derived from guano, the excrement of sea birds. In 1858 Malden was included in an unofficial list of American guano islands—however, the deposits do not appear to have been worked until in March, 1864, Mr. Benjamin B. Nicholson, a British subject of Melbourne, took possession of Malden, and on the 16th May of that year "formally proclaimed Her Majesty's right of sovereignty thereto." During the next two years he is said to have spent upwards of £12,000 in the construction of works etc. on the island and was granted a licence to remove the guano. In 1867 he transferred his licence to *Messrs. Grice, Sumner and Company* of Melbourne.

At first 8 Europeans and 47 Cook Islanders—the latter paid £2 a month—worked the deposits, but, later, the number of natives was increased to 150. Water was obtained by the collection of rain in large receptacles and by means of a distilling plant. During the next thirty years Malden proved the richest and one of the most prosperous of the guano islands, exporting between 12,000 and 14,000 tons *annually*. In operation "Grapple" 1,000 tons of stores and equipment was landed in 1956–1957, and this was considered a major undertaking—one may marvel therefore at the brave spirit of these nineteenth century settlers. The Company's manager until 1897 was one Abraham McCullough who came out as a young man and who died and was buried on the island.

During the early days guano was sold at £4–£5 per ton to the North German market, but later because of competition and the introduction of other fertilizers only the smaller Australian and New Zealand markets remained open. Conditions on the island, too, began to deteriorate because of failure

to re-provision on time In 1913, one native killed another, and was subsequently tried and convicted of manslaughter World War I caused a further slump in the company's affairs, and although there was some improvement during the early twenty's, the company was eventually compelled to close down in August 1927

Between 1927 and 1956 Malden was occasionally visited by H M Ships—an unexploded shell found in October 1956 appears to have been used for target practice at some time or another

Messina first visited Malden on 3rd October, 1956 Relics were found of the small community who had lived there Several of the buildings were constructed of coral stone, others of wood and a few partly of brick Some were still in a reasonable state of preservation The layout and construction was similar to that of old Scottish crofts There was a boathouse housing two hefty long boats with room for a third but the boats were becoming rotten with age The old buildings were interesting to explore, and there were still odd papers and letters lying around The dispensary shelves were laden with old bottles many containing their original drugs Old bills for stores and magazines had been left behind, and the prices were interesting to compare with those of today It appears that the phosphate was taken from the quarries along a narrow gauge tramway to the beach adjoining the boathouse Here was a metal pier In fine weather planks were laid on the pier and the tramway laid down so that the phosphate could easily be transported to the boats and thence to the sailing vessels that used to arrive once a month from Australia These vessels could carry a thousand tons of phosphate. They often called *en route* at Niue and Aitutaki in the Cook Islands to pick up native labour Remnants of the narrow gauge tramway were still present together with some of the old tip-up trucks, and the rusted remains of an old engine There were also a few heaps of phosphate that had been quarried, but never collected Where necessary, viaducts of coral pebbles had been made to support the tramway and these were still in an almost perfect state of preservation

Interesting instructions to the deputy manager were found which were issued during World War I It appears that during this period there were only about three Europeans and thirty Cook Islanders living at Malden and the sailing vessels were no longer under charter but called in sporadically, about every six months He was instructed in the event of a second vessel arriving at Malden whilst the buoy was occupied that he was on no account to order the Master to wait but was to advise him to lay to the windward and watch the Eastern Beacon, this being to prevent a claim for demurrage being made against the company Moreover, in the event of it being necessary for instructions to be passed to the Master of a vessel it should only be done in private, or if any other were present he should be an Officer of the company

Some distance from the buildings lay a rather pathetic cemetery Several of the stones appeared to be of marble and were still in an almost perfect state of preservation There was found the grave of Abraham McCullough and

also that of the wharfinger of the company Here too, was a touching little stone bearing the words

Sacred
to
The Memory of
Dear Little
Malden
Son of
Abraham and Mary
E McCullough
Who Was Taken
From Them
By
The Wild Waves
On the 8th January
1876
Aged 1 year and twelve days
"Not Lost But Gone Before"

It is rather sad to think that Little Malden was born the same year as Sir Winston Churchill, and but for the wild waves might still be alive today Apart from the half-dozen or so European graves, there were several graves close by with Polynesian inscriptions, presumably those of the Cook Islanders At one place on either side of the tramway there were erections of coral pebbles with Polynesian inscriptions which were also taken to be graves although probably not Christian ones

During January, 1956, a Japanese fishing vessel was wrecked on the reef Its crew apparently escaped from the island in the third of the long boats already mentioned and were picked up by another fishing vessel Dozens of glass balls used in connexion with the nets were washed up, and provided much prized souvenirs of our visit to Malden They were of a size larger than I have seen before being fully twelve inches in diameter

Malden lies 240 miles south of the equator, at Longitude 155° W It is a triangular, flat coral island on a reef measuring about five miles by four miles, and entirely enclosing a large salt lagoon, into which the sea enters through subterranean fissures in the coral rock causing the level of the lagoon to rise and fall with the tide It is barren apart from four or five trees and low scrub About thirty ex-domesticated pigs roamed the island until the time of Messina's first visit It was requested that these should be destroyed prior to the setting up of scientific equipment for fear damage might occur A hunt was arranged, and almost all were slaughtered It was suggested that these pigs should be used as a source of fresh pork aboard *Messina*, but on examination of their carcasses it was clear that their diet had been of such a low standard that they had very little flesh on them An autopsy was performed on one by Surgeon Lieutenant Taylor, who, although finding no

evidence of macroscopic disease, very wisely did not pass them fit for human consumption A lone ginger cat was reported, probably a survivor from the Japanese wreck He (or she) presumably lived on the mice which abound on the island, curious creatures, with very long ears Apart from these animals there were numerous large hermit crabs, small lizards and a rather limited bird population

Bathing around the island was dangerous for there was nearly always considerable surf breaking over the reef but some months after our arrival an inland pool was discovered This unusual place was formed from a crevasse in the coral, and it was possible to swim underneath the coral for some way Although a considerable distance from the shore, the pool was nevertheless tidal and as it extended in places to a depth of twenty feet and was cool, by virtue of the shade provided by the overhang it formed a most welcome source of recreation A football field was also provided near the camp The camp, inhabited by scientists, Army and R A F personnel was mainly tented It was provided with a M I Room staffed by one R A F medical attendant In the early days prior to the construction of the airstrips, Lieutenant Ross-Russell, R A M C , was in charge, but he was withdrawn when the airfield became operational At a later stage in the operation the medical officer of *Narvik* used to visit the M I Room two or three times a week

From this time until the "big bang," *Warrior* went to and fro between Malden and Christmas and engaged in a most exhaustive series of rehearsals

(*To be continued*)

TRISTAN DA CUNHA

BY

Surgeon Commander (D) S. R. WALLIS, R.N.

As a result of representation by the Colonial Office, the author in company with Dr T. Oekerse, D.D.S.Harvard, D.D.S.Rand., *D.Sc.*, Pretoria, visited Tristan da Cunha in May 1957 taking passage in S.A.S. *Transvaal*.

Emergency dental treatment was carried out for some of the islanders. Some 216 were dentally examined (the remaining 34 being away fishing) and samples of drinking water, urine and types of fish were obtained to ascertain the fluoride intake of the population.

With the cessation of Royal Naval dental facilities at the Simonstown Naval Base it may not be possible to send Naval dental officers (by whom most of the previous dental surveys have been made) to Tristan in future, and it seems appropriate to summarize previous findings with those of the 1957 visit in this article.

This report is preceded by a short history of Tristan da Cunha which describes the vicissitudes and privations of a small isolated community whose dental condition has been of interest for the past thirty years to authorities on dental disease throughout the world.

It describes the changes in fortune which have overtaken these people and which have in turn influenced their way of living and exposed them to the ravages of dental caries, from which, as Sampson and Moore (1932) showed in their report, they were formerly singularly free.

The Portuguese sailor, Tristan da Cunha, discovered the group of islands in 1506, of which the one to bear his name is the largest, and the only one inhabited today. Thereafter for 150 years nothing was heard of it until in 1656 the Dutch East Indies ship *Nachtglas* went to investigate. In 1767 the English and then the French landed there and explored the group, but the islands remained uninhabited until 1790 when an American, Captain Patten, landed and stayed a few months on Tristan da Cunha collecting seal skins. Early in the nineteenth century British trade with the East was threatened by privateers in the South Atlantic. The British held St. Helena and from 1806 onwards they also occupied the Cape of Good Hope. Ships running between these ports were often attacked by raiders.

On the 4th February 1811, Jonathan Lambert—mariner of the city of Salem, U.S.A.—landed and proclaimed that he had taken absolute possession of the islands of the Tristan group for himself and his heirs (*Boston Gazette*, 18.7.1811). He called it the "Isle of Refreshment." He designed a flag of

blue and red diamonds on a white ground His party were drowned whilst fishing in 1812, leaving only one survivor

In 1816 the Island had a new importance as a consequence of the American War of Independence and the imprisonment of Napoleon on St Helena The British Government were afraid lest attempts to abduct Napoleon would be mounted from the Island A Captain Cloete of the Cape garrison was sent there with 5 officers 4 N C O s 34 privates, and with them went 10 wives and 12 children Royal Artillerymen manned the two 6 pounders which are there to this day Captain Carmichael of the 72nd Regiment was detailed to carry out the first botanical survey, a Lieutenant Aitchison was assistant engineer, and there was a hospital assistant—Private Evens

This party left Table Bay on 3rd November, 1816, in H M S *Falmouth* and the island was sighted from the East on the 25th November They were the first to bring cattle—most of which perished on the voyage—but this party were in fact the beginning of the community we know today Cloete found one man living on the island the sole survivor of Jonathan Lambert's fishing expedition one Thomas Currie He had made much money selling seal skin and sea elephant oil to passing ships—his legendary hoard of gold coins and jewellery has never been found

The Governor of the Cape found that it was too difficult to keep these troops supplied, and in 1817 withdrew the garrison The soldiers—Corporal Glass, married, and Private Swain, single—asked to be left behind to live out their lives separated from wordly cares Two masons (Nankivell and Burnell) also volunteered but left shortly afterwards Glass and Swain were joined by shipwrecked mariners, and an American called Hagan from a sealing ship, who asked to be left there in view of troubles at home A Dutchman Pieter Groen landed in 1835, and made island history by saving many shipwrecked mariners He became the first so-called Governor of the islands and was decorated by the King of Italy and he received the present of a portrait from H M Queen Victoria which now hangs in the island church

So we have the families which comprise the 250 strong community of Tristan at the present Swain, Glass, Green, Repetto Laverello, Rogers and Hagan (Repetto and Laverello were shipwrecked Italian mariners) The Curries and one or two other families subsequently left and did not return

In 1827 the population was eleven—7 men 2 women and 2 children (the second woman had come as a castaway from the wrecked East Indiaman *Blendon Hall*) thus there were five bachelors

Captain Amm a British Whaling captain, was asked if he could obtain five women for these men, and this he did when next he went to St Helena The Governor of this garrison allowed him to take 5 coloured women whom he landed and left on the beach at Tristan at early dawn The five bachelors chose each a wife and they lived happily ever after It is from these families that the community we know today has grown, and which presents the dental morphology and the matters of academic interest which have led to research and discussion through the years

In 1851, the Society for the Propagation of the Gospel sent the Rev W F Taylor who lived there in terrible poverty for six years He was taken away when, in 1857, Bishop Grey of Cape Town visited the island In 1880 the Reverend Dodgson arrived and lived there for four years, and he introduced education He was followed in 1906 by the Reverend John Barrow who did magnificent work until 1909 Thereafter the island fell into oblivion and the inhabitants suffered severe privations during the 1914–1918 war All these years they had to exist by barter or charity, obtaining such essentials as clothing and food from passing ships

In 1922 the Reverend Martin Rogers and his wife volunteered to go there, and matters began to improve with more ships visiting each year

The real turning point in their fortunes came during the 1939–45 war when, in 1942 a Naval party was landed to form a radio and meteorological station In charge of the party was a doctor—Surgeon Lieutenant Commander F J S Woolley, *O B E*, R N V R, who was supported by a Chaplain and a Nursing Sister The medical officer was also styled the "Governor" of the island With the Headman—William Repetto—and a party of 10 he formed an island council Plans were made by this council for the building of a Parish Hall (A new one is now in the process of being built, and it will be named the Prince Philip Hall to commemorate the recent visit of H R H the Duke of Edinburgh in H M Yacht *Britannia*)

At first the party was known as Job 9, but in 1944 it was commissioned H M S *Atlantic Isle* At this commissioning they chose a West African surf boat for the naming ceremony by Mrs Woolley, and the Governor" made a speech before the islanders The base ship was christened with an empty champagne bottle filled with fruit salts coloured with a dash of rum

Woolley and his council faced a number of problems which included the control of grazing, the reduction of geese who fouled the pasture, the care of widows, the suppression of swearing, bird protection and the control of the improvident The main change, however was in the introduction of coinage, British South African currency being used An island newspaper *The Tristan Times* was first produced in 1943 selling for 2 cigarettes 3 potatoes or a halfpenny

Soon after the war an Administrator was appointed His staff (apart from the Padre who remains an S P G commitment) comprised a doctor school teacher, agriculturist and nursing sister The Colonial Development Corporation came to the help of the island by building a fish canning factory, the principal product being the canning of crawfish for export Last year this factory began to pay for the first time

The entire income of the island from which the Administrator finds his exchequer is from the sale of stamps Philatelists have spent £35 000 since January 1955 on the present issue Of this average annual income of £12,000 a year, the Administrator, in addition to the outgoings for his European staff (now including a Canteen Manager) must pay the development corporation £3,000 a year for the freightage from Cape Town to Tristan of 160 tons of

sugar, flour and cheese per annum Thus the long arm of civilization has reached the islanders who are now able to purchase from the canteen, with the currency they earn from fishing the sweet foodstuff which is their unaccustomed delight, and duty free alcohol

Genetics

It has been stated that the islanders are descended from mixed European and coloured stock The persons imported from St Helena were probably of Malayan or African origin, which may have influenced the dentition favourably The coloured influence is evident in the facial features of the islanders As an example, there is the incidence of a degree of bimaxillary prognathism and deep forehead. The racial influence, however, is not easily recognizable in other dental details It may be present and have influenced their previously excellent dentition No doubt their European and mixed ancestors had healthy dentitions, because there are very few examples of dysplasia.

Health

The general health of the islanders is good Sognnaes (1938) reported that the children appeared to be rather slow in development and the fertility of the Tristan marriages appeared to be decreasing He found, however that the islanders showed no clinical evidence of endocrine disturbances or of rickets scurvy, hemeralopia xerophthalmia or other nutritional deficiencies, or of neoplasms tuberculosis, venereal disease, diseases of the heart joints or kidneys or (with the exception of mild endemic dysentery) of the gastro-intestinal tract The present medical officer of the island substantiated these observations in some degree—but he stated that he had noticed some signs of debility due to inter-breeding which is the subject of study at present

Epidemics of common cold invariably appear whenever anyone from the "outside world" visits the island

The island is infested with rats

Diet

Until the post-war years the islanders have depended almost entirely upon local food sources for the bulk of their calorie intake Fish and potatoes formed their staple diet potatoes being preferred to fish Only occasionally was flour or sugar procured from visiting ships

In view of the limited stocks of animals, meat was considered a luxury and was saved for holidays or special occasions The number of cattle on the island at certain periods and, in fact today, would suggest that there was plenty of milk but there has never been abundance The cattle are of poor quality, and lack pastures and proper care, consequently butter and cheese have played an insignificant role in the diet In January and February of each year parties pull over in their canvas boats to Inaccessible Island where

young mollyhawks are taken from their nests These are to this day their greatest delicacy, and they like to render down the fat from them in which to fry their potatoes In September and October, expeditions are made for mollyhawk, peregrine and petrel eggs, and a succulent red crowberry is found on the mountain. Some apples are grown Tea and coffee were great luxuries and only obtained by barter from visiting ships

This state of affairs changed completely with the establishment of the Tristan Development Corporation canteen All forms of proprietary foods can now be obtained, and sugar and sweets can be purchased in proportion to the prosperity of the islanders 51 tons of sugar and 700 lb of sweets were sold to the 250 islanders from the canteen during a six months' period in 1957

Dental Treatment

The greater portion of the dental treatment has been affected by Royal Naval dental officers during their short visits to the island and the dental officer of R M S *Carona* treated several of the islanders on board when his ship was on a luxury world cruise in February 1957 At other times the resident medical officer does his best and has attempted a little semi-permanent conservative treatment

Besides the present 1957 Survey, investigations have been carried out by Marshall (Surgeon R R S *Discovery*) in 1926, Sampson and Moore in 1932, Barnes and Moore in 1937, Sognnaes in 1937, Gamblen in 1953 and King-Turner and Davies in 1955

The figures show that although there is some difference of diagnosis, which is understandable considering the number of independent investigations there has been a significant amount of agreement in the main issues

Tooth Structure

In his very full report Sognnaes noted a retardation of dental development, which it has not been possible to substantiate in succeeding surveys in view of the time factor Apart from this there appears to be no marked abnormality although radiographs revealed marked diffuse calcifications in the pulp chamber and root canals

The suggestion of mottling has not been proved by further investigation, and the presence of white or brown spots in the enamel does not appear to be different from most communities, and certainly is not sufficiently marked to suggest any endemic influence Hypoplasia was present, but not in any unusual degree

Gingival Lesions

There were very few examples of gross gum disease, and no infective lesions were observed There was much calculus and evidence of oral neglect The toothbrush is not often used

Dental Health

The following table sets out the findings of the various surveys

		1932	1937	1952	1955	1957
Total number of persons examined		162	183	230	237	216
Total number of teeth examined		4,060	4 710	6,302	6,455	5,648
Total number of teeth carious		75	200	678	810	550
Percentage of total carious		1·84	4·2	10·73	12·55	9·74
Permanent Teeth	Examined	3,181	3 906	5 521	5 745	5 060
	Carious	74	179	502	657	428
	% carious (of number examined)	1·62	4·6	9·1	11·48	8·4
	Missing (including unerupted + 3rd molars)	—	—	—	476	499
Deciduous Teeth	Examined	879	804	781	710	558
	Carious	1	21	176	153	122
	% carious	113	2·6	22·6	21·55	21·8
	Missing	—	—	—	—	40
Mouths free from caries and extractions		103	92	51	29	39
Mouths free from caries and extractions %		83·33	50·3	22·2	12·39	18·05
Arches	Normal	152	177	222	218	153
	Contracted	4	6	8	16	63
	% Normal	97·43	96·7	96·4	93·16	28·24
Palates (Vaults)	Normal	152	180	225	222	208
	High	4	3	3	9	8
	% Normal	97·43	98·4	97·8	96·1	96·3
TARTAR	None	89	79	121	136	120
	Moderate	57	49	50	—	—
	Much	10	54	59	—	—
	+	—	—	—	70	49
	++	—	—	—	22	21
	+++	—	—	—	9	26
GUMS	Healthy	149	127	133	110	121
	Gingivitis	5	48	87	108	87
		1932	1937	1952	1955	1957
	Pyorrhœa	2	8	10	13	8
	Percentage healthy	95·51	69·4	57·8	47·62	56·03
	Percentage gingivitis	3·21	26·2	37·8	46·75	43·936
	Percentage pyorrhœa	1·22	4·3	4·52	5·63	3·7

Tables of the incidence of caries in the lower age groups are given to emphasize the deterioration in the children's teeth

Age Group 1–5 Deciduous Teeth	1932	1937	1952	1955	1957
No. of persons examined	22	23	22	19	17
No. of teeth examined	372	327	395	348	311
Carious	Nil	14	127	61	54
Missing	—	—	—	5	18

Age Group 6–13					
No. of persons examined	40	43	45	44	40

Permanent Teeth	1932	1937	1952	1955	1957
No. of teeth examined	444	591	707	721	669
Carious	Nil	10	10	47	59
Missing	Nil	Nil	Nil	32	5
Deciduous Teeth					
Teeth examined	503	475	365	345	235
Carious	1	7	49	90	68

Fluorine

Some investigators have suggested that the previous immunity to caries might have been due to the presence of some protective factor such as fluorine in the diet

Samples of drinking water urine and fish were obtained for analysis by the Government Chemist and an abridged report of their findings is given below

Results of Analysis

Water

Samples of water were collected at the following points

(1) Spring source (2) Water run (3) Dam.
(4) Hospital (5) Village tap (lower)
(6) Village tap (higher)

All the samples contained 0 05 part per million fluoride as F The supply is very soft (total hardness 8 p p m as $CaCO_3$) and contains only a small amount of dissolved salts (63 p p m dried at 180° C.) It is neutral or very slightly alkaline in reaction with a pH value of 7 1 to 7 5

Urine

	Age (years)	*Volume (ml.)*	*Fluoride as F* Parts per million	*Fluoride as F* Milligrams
1st child	7	765	0 25	0 19
2nd child	8	765	0 35	0 27
3rd child	9	765	0 35	0 27
4th child	9	735	0 35	0 26
5th child	12	1·050	0 35	0 37

Fish

Specimens of four species of fish fivefinger, bluefish soldier and snoek were received preserved in 10 per cent formaldehyde solution After draining off the formaldehyde the samples were weighed coverd with 250 ml of distilled water and allowed to simmer for one hour After cooling, the flesh was separated from the bones and skin and weighed Fluoride determinations were then made on the following

(1) Formaldehyde solution drained from fish samples
(2) Water in which fish was cooked
(3) Cooked flesh of the fish

Species of fish	*Fluoride as F—parts per million* (1)	(2)	(3)
Fivefinger	0 05	0 05	1 05
Bluefish	0 05	0·05	0 65
Soldier	0 05	0 05	1 05
Snoek	0 05	0 05	1 15

The fluoride content of the formaldehyde solution used for preserving the fish was 0·05 p p m F

All results are given to the nearest 0 05 p p m F

(1) The drinking water contains only traces of fluoride and confirms the result of the previous examination that the fluoride content of the supply is very low

(2) The amount of fluoride in the urine of children excreted per day is similar to that of British children of the same age group and is of the same order as the samples examined in November, 1955

(3) The fluoride content of the cooked flesh of four species of fish ranged from 0 65 to 1 15 parts per million F. On the basis of the raw fish this is equivalent to 0 25 0 55 p p.m F values which are similar to those for the raw flesh of bluefish and fivefingers examined in January, 1957, and to several species of fish eaten in Britain

Only traces of fluoride were found in the formaldehyde solution used for preserving the fish and in the water in which the samples of fish were cooked

This report appears to dispel any question of fluorosis

Conclusion

Although many investigations into the cause of dental caries have shown that no one theory, alone, fits all the known facts be the enquiry made from the acidogenic or proteolytic approach, in biological or biochemical studies or through calcium or fluoride metabolism yet, investigations at Tristan da Cunha appear to show that a rapid and severe deterioration has taken place in what was formerly a healthy isolated community It is difficult to find any alteration in the lives of these people which would cause this, except the introduction of, and the steadily mounting consumption of, 'sophisticated' foods such as refined flour sugar and alcohol

It should be a sobering thought that the benefits of civilization are being bought at such high cost by the inhabitants of Tristan da Cunha

It is strongly recommended that organized dental treatment should be provided for these islanders who, due to interbreeding are already showing signs of debility Oral sepsis can be expected to act with more virulence here than in a community where this was not the case

A dental surgeon, with a technician, should be sent for a period of three months in the first instance, thereafter, annually for one month each year until the dental treatment requirements have been fulfilled

The dental condition of the children is appalling and the most urgent kind of treatment required is the removal of their septic teeth It would be desirable to carry this out with the aid of general anæsthesia

The several dental surveys at Tristan da Cunha have produced interesting material for authorities in many countries of the world Those few dental

surgeons who have visited the island have not only enjoyed the adventure of so doing but have had the privilege of taking part in this valuable scientific research They, by giving what dental treatment was possible during their short stay, have the satisfaction of feeling that they have been able to help these diverting Tristanians in a small way

REFERENCES

BARNES H N V and MOORE, J R, (1937) *Brit dent J.*, **63**, 86.

BEE A G (1932) *J roy nav med Serv* July

GAMBLEN F B (1952) Report to the Medical Director-General of the Navy December

—— (1953) *J roy nav med Serv* Autumn

KING-TURNER E W (1957) *J roy nav med Serv* Spring

KING TURNER E W and DAVIES P (1956) An investigation at Tristan da Cunha *Brit dent J* Oct 16

MARSHALL E H (1926) *Brit dent J* **47**, 1099

PURVER F (1933) Report to Commanding Officer of R R S *Discovery II*

SAMPSON W E A and MOORE J R (1932) *Brit dent J* **51**, 1 397

—— (1932) *Brit med J* **1**, 538

SOGNNAES, R F (1938) Oral Health Survey of Tristan da Cunha. Det Norske Videnskaps Akademi 1 Oslo

CLASSIFIED MEDICAL REFERENCES IN THE WORKS OF SHAKESPEARE

BY

Surgeon-Commander J. W. L. CROSFILL, R.N.

PART XIII

TOOTHPICKS

1551 *Parolles* ... just like the brooch and the toothpick, which wear not now.—*All's Well That Ends Well*, i. 1

1552 *Benedict* I will fetch you a toothpicker now from the farthest inch of Asia.—*Much Ado About Nothing*, ii. 1

1553 *Bastard* Now your traveller—
He and his toothpick at my Worship's mess.—*King John*, i. 1
("a traveller ... walks most commonly with a clove or a toothpick in his mouth." Ben Jonson's "Cynthia's Revels")

1554 *Clown.* He seems to be more noble in being fantastical:
a great man, I'll warrant, I know by the picking on's teeth.—*Winter's Tale*, iv, 3

TORTURE

1555 *Gratiano* Torments will ope your lips.—*Othello*, v. 2.

1556 *Lodovico* For this slave,
If there be any cunning cruelty
That can torment him much and hold him long,
It shall be his.—*Othello*, v. 2

1557 *Sebastian* How have the hours rack'd and tortured me.—*Twelfth Night*, v, 1

1558. *Antony* Their mothers shall but smile when they behold
Their infants quarter'd with the hands of war;
All pity choked with custom of fell deeds.—*Julius Cæsar*, iii. 1

1559 *Edmund* Bringing the murderous coward to the stake.—*King Lear*, ii. 1
(Burning at the stake was a punishment given to women for "petty treason," the crime of husband murder, a punishment which was discontinued in 1790. It was the custom to strangle the women before the flames reached them, a humane procedure which did not always succeed as the Newgate Calendar records in the case of Catherine Hayes who was thus punished in 1726 for petit treason. In his "Religion and Sex" Chapman Cohen gives the bill of costs for the burning of two witches in Aberdeen, Jane Wischert and Isabel Cooker:

	£	s.	d.
Item for 20 loads of Peatts to burn them	2	0	0
for ane boll of colles	1	4	0
for four tar barrelles		6	8
for fir and win barrells		16	8
for a stack and the dressing of it		16	0
for four fathoms of tows	4	0	0
to Jon Justice for their execution		13	4

1560 *Bastard* Drawn in the flattering table of her eye!
Hang'd in the frowning wrinkles of her brow
And quarter'd in her heart
hang'd and drawn and quarter'd —*King John* II 1

(The sentence passed on James Sheppard who was executed at Tyburn on the 17th March 1718 reads "That you be led from hence to the place from whence you came from thence you are to be drawn upon a hurdle to the place of execution and there you are to be hanged by the neck and being alive to be cut down, your bowels to be taken out of your belly and there burnt you being alive your head is to be cut off and your body to be divided into four quarters and your head and quarters to be disposed of as his Majesty shall think fit And God Almighty have mercy on your soul"
Henry IV of France was stabbed to death in his coach by a fanatic named Ravaillac At the place of execution his right hand was thrust into a furnace until it was consumed His flesh was pulled from his bones with red hot pincers burning oil rosin and brimstone, were poured upon the wounds, and melted lead upon his navel. To close the scene of horror four horses were fastened to the four quarters of his body which were torn asunder
The rack, frequently mentioned by Shakespeare was not a legally recognized instrument The following extract is taken from the speech of counsel for the prosecution in the case of Thomas Picton Governor of Trinidad charged with applying torture to one Louisa Calderon in 1801
"The trial by rack is utterly unknown to the law of England though once when the Dukes of Exeter and Suffolk and other ministers of Henry VI had laid a design to introduce the civil law into this kingdom as the rule of government for a beginning thereof they erected a rack of torture which was called in derision the Duke of Exeter's daughter and still remains in the Tower of London where it was occasionally used as an engine of State not of law more than once in the reign of Queen Elizabeth But when upon the assassination of Villiers Duke of Buckingham by Felton it was proposed in the Privy Council to put the assassin to the rack in order to discover his accomplices the judges being consulted declared unanimously that no such proceeding was allowable by the laws of England")

1561 *Hero* press me to death with wit'—*Much Ado About Nothing* III 1

(It is to be suspected that the apparently humanitarian outlook of the judges quoted above was in fact a decision based on nicety of law since the equally cruel torture of the press was a part of judicial procedure until as late as 1772 It was used in cases where the accused refused to plead
William Spiggot was executed for robbery on the highway in 1720 but refused to plead at his trial He was ordered by the Court to be sent to the prison from whence he came and put into a mean room stopped from the light and shall there be laid on the bare ground without any litter straw, or other covering and without any garment about him except something to hide his privy members He shall lie upon his back his head shall be covered and his feet shall be bare One of his arms shall be drawn with a cord to one side of the room, and the other arm to the other side and his legs shall be served in the like manner Then there shall be laid upon his body as much iron or stone as he can bear and more And the first day after he shall have three morsels of barley bread without any drink and the second day he shall be allowed to drink as much as he can at three times, of the water that is next the prison door except running water without any bread and this shall be his diet till he dies and he against whom this judgment shall be given forfeits his goods to the King
Spiggot withstood this treatment, a weight of 350 pounds being placed on him for half an hour when a further 50 pounds being added he decided to plead
These extracts on the use of the rack hanging and quartering and the press are taken from the first edition of Knapp and Baldwin's "Newgate Calendar")

1562 *Arthur* Must you with hot irons burn out both mine eyes?'—*King John* IV 1

1563 *Anne* O, would to God that the inclusive verge
Of golden metal that must round my brow
Were red hot steel to sear me to the brain!
Anointed let me be with deadly venom
And die ere men can say God save the Queen!—*Richard III* IV 1

(The Earl of Atholl who murdered James I of Scotland was made to suffer by the application of a red-hot metal crown)

D

1564 *Falstaff* No, were I at the strappado, or all the racks
in the world, I would not tell you on compulsion. —*Henry IV*, Part I, ii, 4
(In punishment by the strappado the victims were suspended from the wrists, the which had been tied behind, and then let drop.)

1565 *Antigonus* ... would I knew the villain,
I would land-damn him. —*Winter's Tale*, ii, 1
(I have not come across any other reference to this form of torture whose origin is uncertain. Hanson attempts to explain it by the Saxon "hland" meaning urine. This implies a deliberate obstruction to the outflow such as would be produced by ligatures. Such an interpretation is in keeping with the context.)

1566 *Bassanio* For as I am, I live upon the rack.
Portia Upon the rack, Bassanio! then confess
What treason there is mingled with your love.
Ay, but I fear you speak upon the rack,
Where men enforced do speak any thing. —*Merchant of Venice*, iii, 2
(The Merchant of Venice was entered at Stationer's Hall in 1598; the same year saw the rack used "as an engine of State" on one Squires.)

1567 *Mortimer* Even like a man new haled from the rack,
So fare my limbs with long imprisonment. —*Henry VI*, Part 1, ii, 5

1568 *Autolycus* He has a son, who shall be flay'd alive; then,
'nointed over with honey, set on the head of a
wasp's nest; then stand till he be three quarters
and a dram dead; then recover'd again with aquavitae
or some other hot infusion; then, raw as
he is, and in the hottest day prognostication
proclaims, shall he be set against a brick wall,
the Sun looking with a southward eye upon him,
where he is to behold him with flies blown to
death. —*Winter's Tale*, iv, 3

1569 *Demetrius* So, now go tell, an if thy tongue can speak,
Who 'twas that cut it out, and ravish'd thee.

Marcus ... Alas, a crimson river of warm blood,
Like to a bubbling fountain stirr'd with wind,
Doth rise and fall between thy rosed lips,
Coming and going with thy honey breath.
And, notwithstanding all this loss of blood,—
As from a conduit with three issuing spouts,—
Yet do thy cheeks look red as Titan's face
Blushing ... —*Titus Andronicus*, ii, 3
(Three issuing spouts because Lavinia has had both hands and her tongue removed in addition to her loss of chastity. Shakespeare obviously realises that he is committing a clinical error in allowing a blush to be present when Lavinia ought to be exhibiting rather the pallor of shock and exsanguination.)

1570 *Escalus* Take him hence; to the rack with him! We'll touse you
Joint by joint, but we will know your purpose.
Duke ... Be not so hot; the Duke
Dare no more stretch this finger of mine than he
Dare rack his own. —*Measure for Measure*, v, 1

Transmigration

1571. *Gratiano* Thou almost makest me waver in my faith
To hold opinion with Pythagoras,
That souls of animals infuse themselves
Into the trunks of men. —*Merchant of Venice*, iv, 1

1572 *Clown* Hold thou the opinion of Pythagoras ere I will allow of thy wit
and fear to kill a woodcock, lest thou dispossess the soul of thy grandam
Twelfth Night iv 2

1573 *Rosalind* I was never so be-rhymed since Pythagoras' time
that I was an Irish rat, which I can hardly remember —*As You Like It* iii 2
("Rhyme them to death as they do Irish rats" Ben Jonson's "Poetaster")

Treatment of

(a) *Drunkenness*

1574 *Apemantus* will the cold brook
Candied with ice, caudle thy morning taste
To cure thy o'er-night's surfeit?—*Timon of Athens* iv 3

("Cassius, whom we lately considered the most ingenious physician of our time, administered cold water to a certain person with fever and suffering from thirst, the which he had ascertained had attacked him after intoxication" Celsus "De Re Medica")

(b) *Mental Disorder*

1575 *Edgar* Poor Tom who is whipp'd from tithing to tithing
and stock-punished and imprison'd —*King Lear* iii 4

(The punishment given to vagabonds, of whom the Bedlam beggars were one variety, was that they be "grievously whipped and burnt through the gristle of the right ear with an hot iron of the compass of an inch about". A year's probation followed; if during this time the person was again convicted the same punishment was given and the left ear was used. If convicted a third time he was condemned "to suffer pains of death as a felon without benefit of clergy or sanctuary" says William Harrison in his "Description of England" 1587)

1576 *Kent* This rest might yet have balm'd thy broken senses
Which if convenience will not allow
Stand in hard cure —*King Lear* iii 6

1577 *Cordelia* What can man's wisdom
In the restoring his bereaved sense?

Doctor There is means, madam
Our foster nurse of nature is repose
The which he lacks; that to provoke in him
Are many simples operative, whose power
Will close the eyes of anguish —*King Lear* iv 4

(Shakespeare's therapy, that of narcosis, was much ahead of his time. His whole outlook on mental disturbance is a much more humane one than was that of the next hundred years. The use of prolonged narcosis in these conditions is a modern development.)

1578 *Cordelia* How does the King?

Doctor Madam, sleeps still

Cordelia O you kind gods
Cure this great breach in his abused nature

Doctor So please your Majesty
That we may wake the King? he hath slept long.

Cordelia Be govern'd by your knowledge, and proceed
I' the sway of your will

Doctor Be by, good madam, when we do awake him
I doubt not of his temperance
Please you, draw near. Louder the music there
He's scarce awake, let him alone awhile
Be comforted, good madam, the great rage
You see is cured in him, and yet 'tis danger
To make him even o'er the time he has lost —*King Lear* iv 7

(temperance, control
The use of music as a therapy for mental disorder has been noted under Dancing Mania.)

1579 *Servant* Your Honour's players, hearing your amendment,
Are come to play a pleasant comedy;
For so your doctors hold it very meet,
Seeing too much sadness hath congeal'd your blood
And melancholy is the nurse of frenzy —
Taming of the Shrew Induction Scene 2

1580 *King* (reads) So it is, besieged with sable-coloured melancholy,
I did commend the black oppressing humour to the
most wholesome physic of thy health-giving air,
and, as I am a gentleman, betook myself to walk —
Page Master Ford, you are not to go loose any longer
you must be pinion'd
Evans Why, this is lunatics! this is mad as a mad dog!—
Merry Wives of Windsor IV 2

1581 *Romeo* Not mad, but bound more than a madman is
Shut up in prison, kept without my food
Whipp'd and tormented and—*Romeo and Juliet* I 2

1582 *Conrade* What the good year, my lord! why are you thus out of measure sad?
You should hear reason
Don John And when I have heard it, what blessing bringeth it?
Conrade If not a present remedy, yet a patient sufferance
Don John I wonder that thou, being (as thou say'st thou art)
born under Saturn, goest about to apply a moral medicine to
a mortifying mischief —*Much Ado About Nothing* I 3
(good year see SYPHILIS)

1583 *Leonato* men
Can counsel and speak comfort to that grief
Which they themselves not feel, but, tasting it
Their counsel turns to passion, which before
Would give preceptial medicine to rage,
Fetter strong madness in a silken thread
Charm ache with air, and agony with words —
Much Ado About Nothing V 1

1584 *Hamlet* Do you see yonder cloud that's almost in shape of a camel?
Polonius By the Mass, and 'tis like a camel, indeed
Hamlet Methinks it is like a weasel
Polonius It is backed like a weasel
Hamlet Or like a whale?
Polonius Very like a whale —*Hamlet* III 2.

(c) *Wounds*

1585 *3rd Servant* I'll fetch some flax and whites of eggs
T' apply to his bleeding face —*King Lear* III, 7
(White of egg still survives as an external application, being a constituent of Terpentine liniment.)

1586. *Alcibiades* Is this the balsam that the usuring Senate
Pours into captain's wounds —*Timon of Athens* III 5

1587 *Norfolk* Pierced to the soul with slander's venom'd spear,
The which no balm can cure but his heart blood
Which breathed this poison —*Richard II* I 1
(There was great faith in the many balms or balsams described in the medical literature of the time. The following typical example is from Gerard's Herbal.

An excellent Balme [illegible] wounds and punctures made by some narrow sharpe pointed weapon Which Balsame doth bring up the flesh from the bottome verie speedily and also heale simple cuts in the flesh according to the first intention that is to glew or sodir the lips of the wound together not procuring matter or corruption to it as is commonly seene in the healing of wounds The Receit is thus Take Oile of Roses Oile of St John's Wort of either one pinte the leaves of Tabaco stamped small in a stone mortar two pounds boile them together to the consumption of the juice straine it and put it to the fire againe adding thereunto of Venice Terpentine two ounces of Olibanum and Mastike of either half an ounce, in most fine and subtil pouder the which you may at all times make an unguent or salve, by putting thereto wax and rosin to give unto it a stiffe body, which worketh exceeding well in malignant and virulent ulcers as in wounds and punctures

I send this jewell unto you women of all sorts
especially such as cure and helpe the poore and impotent of your countrey without reward")

1588 *Gonzalo* You rub the sore
When you should bring the plaster —*The Tempest* II 1

Tuberculosis

1589 *Perdita* pale primroses
That die unmarried ere they can behold
Bright Phoebus in his strength — a malady
Most incident to maids —*Winter's Tale* IV 3

(Bucknill sees a reference to juvenile phthisis in this quotation It might equally refer to chlorosis or wasting from [illegible])

1590 *Beatrice* I would not deny you but, by this good day I yield upon great persuasion and partly to save your life, for I was told you were in a consumption —*Much Ado About Nothing* V 4

(Consumption was used vaguely for any wasting condition Benedick's state was that of unrequited love There is thus no unequivocal reference to tuberculosis although such a pathology had been well recognized from the early days Hippocrates for example gives an account of both respiratory and bone tuberculosis making the observation that spinal tuberculosis is usually found above the diaphragm.)

Twins

1591 *Sebastian* myself and a sister both born in an hour —*Twelfth Night*, II 1

1592 *Antonio* How have you made division of yourself?
An apple cleft in two is not more twin
Than these two creatures —*Twelfth Night* V 1

1593 *Timon* Twinn'd brothers of one womb —
Whose procreation residence and birth
Scarce is dividant —*Timon of Athens*, IV, 3

1594 *Aegon* A joyful mother of two goodly sons
And which was strange the one so like the other
As could not be distinguish'd but by names
That very hour and in the self-same inn
A meaner woman was delivered
Of such a burden male twins both alike —*Comedy of Errors* [illegible]

(Thomas Raynold's Birth of Mankind 1545 has illustrations showing the various positions taken up by the foetus in utero including multiple births The text contains instructions for podalic version)

Ulcer

1595 *Hamlet* — but my madness speaks
It will but skin and film the ulcerous place
Whilst rank corruption, mining all within
Infects unseen —*Hamlet* iii 4

1596 *King* — But to the quick o' the ulcer —*Hamlet* iv 4

1597 *Hamlet* — To let this canker of our nature come
In further evil?—*Hamlet* v 2.

1598 *Constance* — a canker'd grandam's will —*King John* ii 1

1599 *Constance* — But now will canker-sorrow eat my bud
And chase the native beauty from his cheek,
And he will look as hollow as a ghost,
As dim and meagre as an ague fit
And so he'll die —*King John* iii 4

1600 *Salisbury* — I am not glad that such a sore of time
Should seek a plaster by condemn'd revolt,
and heal th' inveterate canker of one wound
By making many —*King John* v. 2

(Referring to the practice of making running sores on healthy skin by blistering agents the so-called issues The idea was that the corruption would flow away by these means They were used both as curative and preventive measures It was noted during the plague that those persons in whom the buboes broke down and discharged did better than those in whom the buboes remained hard This appeared to agree with the idea that the corruption either found a way out through the skin or else went inwards and infected the inward parts and thereby proved fatal There was therefore apparently sound theoretical basis for the production of issues and the allied belief in "laudable pus")

1601 *Pucelle* — Care is no cure but rather corrosive
For things that are not to be remedied —*Henry VI* Part 1, iii 3

1602 *Queen* — Away! though parting be a fretful corsive
It is applied to a deathful wound —*Henry VI* Part 2, iii 2.

Urine

1603 *Sir Toby* — I would not so much as make water but in a sink-a-pace —
Twelfth Night i, 3

1604 *4th Countryman* — Now to be a frampal, now to piss o' the nettle —*Two Noble Kinsmen* iii 5

(frampal wayward The superstition that urinating on nettles would make one perverse seems to have died out The belief that the picking of Dandelions causes nocturnal enuresis still persists in England The French ensure this persistence by calling the dandelion "pis-en-lit")

1605 *Trinculo* — Monster I do smell all horse piss at which my nose
is in great indignation —*The Tempest* iv 1

(The use of urine as both an external application and as an inward remedy still persists in folk medicine
The Stockholm MSS of John Arderne recommends the use of urine mixed with butter for application to the eye
Madame de Sevigne writing on June 13th 1685 records that she had taken essence of urine for the vapours and that it kept her awake Sea horse pizzle sold at 4d an ounce in 1685 that of the Stag being presumably more efficient at 6d an ounce)

Uroscopy

1606	*Fabian*	Carry his water to the wise woman —*Twelfth Night* iii 4
1607	*Macbeth*	If thou couldst doctor cast The water of my land find her disease And purge it to a sound and pristine health —*Macbeth* v 3
1608	*Falstaff* *Page*	Sirrah you giant what says the doctor to my water? He said sir the water itself was a good healthy water but for the party that owed it he might have more diseases than he knew for —*Henry IV* Part 2 i 2
1609	*Speed*	these follies are within you and shine through you like the water in an urinal that not an eye that sees you but is a physician to comment on your malady —*Two Gentlemen of Verona* ii 1

The practice of Uroscopy or water casting the visual examination of urine and consequent diagnosis and prognosis was an art much practised in the Middle Ages The alterations in the appearance of the urine during illness had attracted the attention of physicians in classical times Relatively little attention was paid to the fæces In the second century Aretæus observed the polyuria of diabetes mellitus and considered that it was due to the tissues turning into urine Thomas Linacre the first president of the Royal College of Physicians (1551) denounced the practice of uroscopy A college statute was passed which forbade its members to make a diagnosis on the strength of urine examination only A clinical examination had also to be made

That clinical attention was very much directed towards the urine, both by orthodox and unorthodox practitioners is evident from the numerous references in the herbals to preparations for provoking urine It is quite refreshing and rare to find a herb with an opposite effect

('Darnel Government and Virtues' It is a malicious plant of sullen Saturn As it is not without some vices so hath it also many virtues The meal of Darnel is very good to stay gangrenes, and such-like fretting and eating cankers and putrid sores, it also cleanseth the skin of all leprosies morphews ringworms and the like if it be used with salt and raddish-roots And being used with quick brimstone and vinegar it dissolveth knots and kernels and breaketh those that are hard to be dissolved, being boiled in wine with pigeon's dung and linseed a decoction thereon made with water and honey, and the place bathed therewith is profitable for the sciatica Darnel meal applied in a poultice, draweth forth splinters and broken bones from the flesh, the red darnel boiled in red wine and taken, stayeth the lask and all other fluxes, and women's bloody issues, and restraineth urine that passeth away too suddenly

Culpepper's Herbal—Sibley's 1805 edition)

Varicose Veins

1610	*Malvolio*	this does make some obstruction in the blood this cross gartering —*Twelfth Night* iii 4

(The cross gartering extended from foot to knee in a lattice-work pattern The use of such a garter as a tourniquet is suggested in quotation 619)

1611 *Aga...* ...checks and disasters
Grow in the veins of actions highest rear'd
As knots, by the conflux of meeting sap
Infect the sound pine and divert his grain
Tortive and errant from his course of growth —*Troilus and Cressida* I 3

(Harvey's De Motu Cordis 1628 has illustrations which are the mirror image of those in the ... of Fabricius whose pupil Harvey had been. Fabricius described the valves in his chapter De Venarum Ostiolis purely as anatomical structures and failed to draw the haemodynamic inferences on which Harvey based his argument for the circulation of the blood. Harvey began lecturing on anatomy in England in 1616 a week before Shakespeare died.)

Veins

1612 *Hotspur* Yea on his part I'll empty all these veins
And shed my dear blood drop by drop i' the dust —*Henry IV* Part I I 3

1613 *Bassanio* Only my blood speaks to you in my veins —*Merchant of Venice* III 2

1614 *Iachimo* The azure harebell like thy veins —*Cymbeline*, IV 2

Venery

1615 *King* Those girls of Italy take heed of them
They say our French lack language to deny,
If they demand —*All's Well That Ends Well* II, 1

1616 *Don Pedro* Nay if Cupid have not spent all his quiver in Venice —
Much Ado About Nothing I 1

(The fact that Syphilis appeared in epidemic form in Europe as a result of the campaign in Italy some 100 years before Shakespeare wrote may be the reason why that country was thought to be particularly licentious. That this idea was not Shakespeare's own is shown by this extract from Roger Ascham's "Scholemaster" written in 1570

These be the enchantment of Circes brought out of Italy to mar man's manners in England much by example of ill life but more by precepts of fond books of late translated out of Italian into English sold in every shop in London commended by honest titles the sooner to corrupt honest manners dedicated over boldly to virtuous and honourable personages the easier to beguile simple and innocent wits.

The publication of Florio's New World of Words an Italian English dictionary in 1611 is further proof of the existence at that time of an interest in Italian literature.

Fracastor himself Italian refers to Syphilis as the French disease. This association of the French with venery a common belief today was also shared by the poet as the next quotation indicates)

1617 *Lafeu* These boys are of ice, they'll none of her
sure they are bastards to the English the French ne'er got 'em —
All's Well That Ends Well, II. 3

1618 *Falstaff* I am here a Windsor stag Send me a cool rut-time
Jove or who can blame me to piss my tallow?—
Merry Wives of Windsor V 5

(This is presumably a reference to spermatorrhoea

During the time of their rut the harts live with small sustenance the red mushrooms helpeth well to make pysse their grease they are then so vehement in heat Turberville's Book of Hunting 1575

Venery was thought to predispose to the plague. It is interesting and inexplicable to note that in his description of London Bogherst says that the prostitutes came off lightly. Celsus thought that venery was only to be indulged in at suitable seasons preferably in the springtime. It was to be deprecated in the summer and autumn but was not so injurious in the winter. He adds Also if any kinds of diseases have occurred to an infant and did not terminate either at puberty or at the first sexual intercourse or in the case of females at the first period such are generally chronic diseases.)

VERMIN (*See* Parasites)

1619 *Lear* What is your study?
Edgar How to prevent the fiend and to kill vermin —*King Lear* III 4

VIRILITY

1620 *Fool* in all shapes that man goes up and down in from fourscore to thirteen this spirit walks in —*Timon of Athens* II 2

VISION

1621 *Macduff* Approach the chamber and destroy your sight
With a new Gorgon —*Macbeth* II 1
(To view the Gorgon sisters directly meant being turned to stone)

1622. *Macbeth* Come seeling night
Scarf up the tender eye of pitiful day —*Macbeth* III 2
(Seeling was a term of falconry meaning the sewing together of the eyelids)

1623 *Iago* To seel her father s eyes up close as oak —*Othello* III 3

1624. *Cassius* My sight was ever thick —*Hamlet* V 3

1625 *Hamlet* Eyes without feeling feeling without sight —*Hamlet* III 4

1626 *Lear* Mine eyes are none o the best
Tis a dull light —*King Lear* V 3
(Lear s vision was failing as he lay dying It is said that Goethe made a similar complaint as he lay dying and that his last words were More light)

1627 *Warwick* These eyes that now are dimm d with death s black veil —
Henry VI Part 3 V 2

1628 *Catherine* Mine eyes grow dim Farewell —*Henry VIII* IV 2.

1629 *Nestor* I see them not with my old eyes.—*Troilus and Cressida* I 3

1630 *Gloster* How long hast thou been blind?
Simpcox O born so master —*Henry VI* Part 2 II 1

1631 *Pericles* For vice repeated is like the wandering wind
Blows dust in other s eyes to spread itself
And yet the end of all is bought thus dear
The breath is gone and the sore eyes see clear—
To stop the air would hurt them —*Pericles* I 1

1632 *Romeo* He that is strucken blind cannot forget
The precious treasure of his eyesight lost.—*Romeo and Juliet* I 1

1633 *Juliet* Either my eyesight fails or thou look st pale
Romeo And trust me love in my eye so do you
Dry sorrow drinks our blood —*Romeo and Juliet*, III, 5

1634 *Imogen* I have read three hours then mine eyes are weak
Fold down the leaf where I have left —*Cymbeline* II 2

1635 *Bushy* For sorrow s eye glazed with blinding tears
Divides one thing entire to many objects
Like perspectives which rightly gazed upon,
Show nothing but confusion —eyed awry,
Distinguish form —*Richard II* II 2
(Perspectives were optical toys the visual effect varying with the angle of vision There is another reference to them in Twelfth Night V 1 A natural perspective that is and is not
In the Fort William Museum is a Jacobite relic of the nature of a perspective A cylinder has painted on it a portrait of Prince Charlie which is not recognizable as any such by direct vision but only when the image is viewed on a mirror surface)

1636 *Pucelle* 'Twas full of darnel—do you like the taste?—*Henry VI* Part 1, III, 2.
(Darnel gave unpleasant taste to the bread. Gerard says the admixture of this weed "hurteth the eyes and maketh them dim.")

Voice

1637 *Coriolanus* ... a pipe
Small as an eunuch's or the virgin voice
That babies lulls asleep!—*Coriolanus* III, 2.

1638 *Slender* Mistress Anne Page. She has brown hair and speaks small like a woman.
—*Merry Wives of Windsor* I, 1

1639 *Portia* And speak between the change of man and boy
With a reed voice.—*Merchant of Venice* III, 4.

1640 1st *Page* Shall we clap into 't roundly, without hawking, or spitting, or saying we are hoarse, which are only the prologues to a bad voice?—
As You Like It V, 3

1641 *Hamlet* Pray God, your voice, like a piece of uncurrent gold,
be not crack'd within the ring.—*Hamlet*, II, 2.
(If the crack in the edge of an old coin reached the inner ring, inside which the King's head figured, the coin was withdrawn.)

Vomit

1642 *Iachimo* Sluttery, to such neat excellence opposed,
Should make desire vomit from emptiness,
Not so allured to feed.—*Cymbeline*, I, 6.

1643 *Archbishop* And, being now trimm'd in thine own desires,
Thou, beastly feeder, art so full of him,
That thou provokest thyself to cast him up.—*Henry IV* Part 2, I, 3
(Of the Roman habit of vomiting as an aid to feasting Celsus wrote: "I observe that vomiting was excluded by Asclepiades in that book which he wrote on the preservation of health; nor do I blame him if he was displeased with the custom of those who, by evacuating daily, endeavoured to acquire a power of gluttonizing. He recommended that vomiting should be practised in the winter rather than in the summer in order that catarrhs might be eased thereby."
Gerard has a pleasant sounding emetic made of Groundsel: "Boiled in ale with a little hony and vinegar, it provoketh vomit, especially if you adde thereto a few roots of Asarabacca.")

Wart

1644 *Quickly* Have not your Worship a wart above your eye?—
Merry Wives of Windsor, I, 4

Wasp Sting

1645 *Catherine* If I be waspish, best beware my sting.
Petruchio My remedy is then, to pluck it out.—*Taming of the Shrew*, II, 1
(Gerard would have tried Mint which "is laid to the stinging of wasps with good successe.")

1646 *Northumberland* Why, what a wasp-stung and impatient fool
Hotspur Why, look you, I am whipp'd and scourged with rods,
Nettled, and stung with pismires.—*Henry IV* Part 1, I, 3
(pismires, ants.)

Wasting from Sighing

1647 *Oberon* All fancy-sick she is and pale of cheer
With sighs of love that cost the fresh blood dear
Midsummer Night's Dream iii 2.

1648 *King* like a spendthrift sigh
That hurts by easing —*Hamlet* iv 4

(For further references to the effects of sighing see
Blood Sighing Chlorosis Pining Consumption and Tuberculosis)

Weaning

1649 *Nurse* On Lammas-eve at night shall she be fourteen
That shall she marry¹ I remember it well
'Tis since the earthquake now eleven years
And she was wean'd,—I shall never forget it —
Of all the days of the year upon that day,
For I had then laid wormwood to my dug
Sitting in the sun under the dove-house wall
My lord and you were then at Mantua
Nay, I do bear a brain But, as I said
When it did taste the wormwood on the nipple
Of my dug and felt it bitter pretty fool
To see it tetchy and fall out wi' the dug!
And since that time it is eleven years
For then she could stand alone nay by the Rood
She could have run and waddled all about
For even the day before, she broke her brow —*Romeo and Juliet* i 3

(Culpeper's account of Wormwood (Sibley edition 1805) gives an excellent idea of the astrological approach to pharmacy and of the many virtues which were ascribed to various herbs

Wormwood is a herb of Mars. It is hot and dry in the first degree viz, just as hot as your blood and no hotter It remedies the evils choler can inflict on the body of man by sympathy
it helps the evils Venus produces by antipathy and it cleanseth the body of choler It provokes urine helps surfeits swellings in the belly it causeth an appetite to meat because Mars rules the attractive faculty in man The Sun never shone upon a better herb for the yellow jaundice than this Besides all this, wormwood provokes the terms Wormwood being an herb of Mars is a present remedy for the biting of rats and mice. Mix a little wormwood with your ink and neither rats nor mice will touch the paper that is written with it Wormwood is a present cure for the cholic

In addition it appears that it cures dimness of sight by antipathy makes beer it is a remedy for stinking breath and is a cure for wasp-stinging as well as those of hornets and scorpions all diseases of the throat wheals pushes black and blue spots and finally (laid amongst the clothes will hinder moths from hurting them

(*To be continued*)

Clinical Notes and Cases

A CASE OF SIMPLE PYLORIC HYPERTROPHY IN THE ADULT

BY

Surgeon Commander C D COODE, R N

THE patient A B aged 56 and employed in the Admiralty Police, was admitted to R N Hospital Haslar in September 1957 His notes are summarized below

History—Admission was requested by the patient's own doctor ashore for investigation of breathlessness retrosternal pain and flatulent dyspepsia The last symptom was particularly brought on by fatty foods and so he avoided these in his diet He had lost a little weight recently In the first instance he was admitted to the medical side, where an acute coronary thrombosis was ruled out While his cardiovascular system was under observation he developed a thrombophlebitis of the left leg and thigh, which was treated by anticoagulants and which resolved General abdominal examination was negative

Investigations—In seeking a cause for the flatulent dyspepsia a barium meal was ordered and this was repeated one month later at the request of the radiologist In the first meal a pyloric stenosis was seen associated with some delay in gastric emptying The stenosis was present and unchanged in the second meal and was unaffected by antispasmodics

The report reads as follows

> The previously reported pyloric stenosis remains unchanged and therefore in my opinion must be considered to be organic and not due to local spasm I am still unable to demonstrate any suggestion of an ulcer in this area A small amount of barium remained in the stomach at three hours Although this stenosis may be due to an old ulcer I think the possibility of an annular carcinoma in this area must be considered"

In the radiologist's opinion the appearances were such that the presence of an annular carcinoma of the pre pyloric region could not be excluded and at this point a surgical opinion was sought

The surgical opinion was similar to that of the radiologist A concentric narrowing of the pyloric area appeared to have occurred, leaving a quill sized channel of barium 1 1½ in long between the body of the stomach and the duodenal cap Gastric carcinoma could not be disproved and delay might jeopardise the chances of successful treatment Laparotomy was therefore advised and the patient agreed

Operation—11th November 1957 An upper mid-line incision was used and the upper abdomen carefully explored

The narrowed antral pyloric area of the stomach was at once found and palpated The sensation was of a thickened heavy fleshy mass, symmetrical and with minimal lumen The serous coat was normal The swelling had a whitish appearance It shaded off quite distinctly into the stomach and duodenum at either side, but with no definite sharp margin Apart from this there was no gross evidence of disease. There were no enlarged regional

glands the liver was smooth and regular the b[illegible] and the duodenum was also normal

At this stage it appeared that the condition was most probably due to extensive scarring associated with chronic gastric ulcer and a straightforward partial gastrectomy was therefore performed The regional lymph drainage was not cleared and about half of the stomach was removed

After operation the specimen was opened and no sign of an active or healed ulcer was found

Histology — No ulcer could be found on examination but the mucosa was grossly atrophic Section through this area in the pyloric antrum shows atrophy of secreting mucosa with gross hypertrophy of underlying muscle Atrophic gastritis "

Discussion

The patient made uneventful progress, but meanwhile the surgeon gave considerable thought to what to him was a unique case, with findings at operation not fully understood A search of the literature shortly revealed the answer to the problem in an article entitled "Simple Pyloric Hypertrophy in the Adult" by Gordon H D McNaught [1] Mr McNaught served recently in Haslar as a Surgeon Lieutenant-Commander R N V R Readers are referred to his article and to its final bibliography but it is desired to acknowledge here the use made of it in the following remarks

Simple pyloric hypertrophy in the adult is a well-defined entity, but its existence is not widely appreciated It is not, apparently, an excessively rare occurrence in hospital practice At the Mayo Clinic 61 cases were found in 60,000 barium meals in five years

Cruveilhier [2] first described the condition in 1835 and scattered reports have since appeared in the literature

The pathology is basically a thick firm hypertrophic pylorus and these changes spread into the antrum The cause of the enlargement is grossly hypertrophied circular sphincter muscles of which the two largest lie close together on the lesser curve but may diverge (allowing a widening of the central mucosal-lined channel) towards the greater curve

Complications include pyloric stenosis with vomiting, bleeding from the subepithelial venous plexus of the mucosa and associated other diseases, especially gastric and duodenal ulcer

Clinical Features —An age incidence of from 12 to 80 years has been described, but many cases seem to lie in the 40 to 65 age group (*see below* under Differential Diagnosis)

A long history is seldom obtained and A B s flatulent dyspepsia of short duration is quite typical

If the condition progresses signs of pyloric obstruction appear Bleeding may arise, and signs of associated diseases may complicate the picture The patient may show evidence of recent loss of weight

Radiological appearances are strikingly uniform The pyloric canal is elongated, and the central canal (which may be a little off centre) is narrowed, but shows mucosal continuity This canal is unaffected by medication or manipulation There are excessive mucosal folds in the antrum, but gastric dilatation and retention are uncommon. The "entry" of the pyloric canal is smooth and rounded In the middle of the narrow canal a lateral "offshoot" of barium (between the two sphincters) may or may not be seen The "exit" of the pylorus bulges into the duodenal cap, giving a "mushroom" appearance the narrow pyloric canal representing the stalk

Diagnosis and Differential Diagnosis —If the radiological appearances are typical a reasonably confident diagnosis can be made Nevertheless, gastric carcinoma is a differential diagnosis of great importance especially in view of the age groups frequently involved

Treatment

A high proportion of sufferers from this condition appears to come to laparotomy for the following reasons

(1) To eliminate uncertainty in diagnosis and exclude gastric cancer
(2) To treat pyloric obstruction
(3) To treat hæmorrhage
(4) To deal with associated disease

In the event, a partial gastrectomy is often performed, and there is no doubt that this is the advisable procedure where, as in the author's case, a pyloric swelling of doubtful ætiology is found

Conclusion

With more awareness of the occurrence and nature of this condition, it would seem, on theoretical grounds, that adequate surgical treatment in an uncomplicated case would consist of resection of the hypertrophied pylorus and antral area, and restoration of continuity of stomach and duodenum by a type of Billroth I procedure

Acknowledgments

My thanks are due to Surgeon Lieutenant Commander G McNaught R N V R , to whom notes and films of this case were submitted, and who confirmed the diagnosis Also to Surgeon Commander P K Fraser, R N , for the histological report, and to Surgeon Commander J K Salmon, R N , for the radiological examination of the patient and for his reports

Finally I have to thank Surgeon Rear-Admiral E T S Rudd, *C B C B E* , for permission to report this unusual case

References

[1] McNaught G H D (1957) *J roy Coll Surg Edinb* 3 1 35-41
[2] Cruveilhier, J (1835) Anatomie pathologique du Corps humain, 1820-1842 Paris J B Baillière

A CASE OF CONGENITAL ABNORMALITIES

(Lobster Claw Deformity)

BY

Surgeon Lieutenant L. D SHARPE, R.N.V.R.

LOBSTER CLAW deformity, a form of syndactylism is a rare congenital defect Philip Wiles (1949) states that the condition is almost always hereditary although in the case illustrated in his book there was no history of any similar defect in any relative Wiles also states that the function of

FIG 1

such a hand can be remarkably good even without any attempt at reconstructive surgery

Bunnell (1948) states that split hands and feet are often hereditary and bilateral Tubby traced them through five generations, and Lewis and

Emberton found that all but 13 out of 130 cases that they collected were hereditary."

The patient reported here is a Chinese boy aged 7 years who was the ninth child of a family of twelve. There was no history of any trauma, illness or abnormality during the mother's pregnancy and no similar abnormality has been noticed in any other members of the family. Two siblings had died during infancy, the cause of death being "Fever" which is a common diagnosis covering several illnesses in the Far East. One other brother died one month after I saw this patient for the first time, the cause being miliary tuberculosis.

The child was of normal intelligence, co-operative but shy. He was a year late in beginning to walk, but he started speaking at 13 months. He was 3 ft. 3½ in. in height and weighed 66½ lb., which is near the average for his race and age in Singapore.

The abnormalities are clearly shown in figs. 1 to 3.

Fig. [illegible]

Figs. 1 and 2 show the syndactyly of the hands. The [illegible] of the left index, middle and ring [illegible] are joined into one sheet of tissue. The [illegible] of the right middle and ring [illegible] are [illegible] joined. The toes on both feet are joined together by webs of skin [illegible] large and flattened, and those of the right 4th and 5th toes almost absent. X-rays [illegible] although there [illegible] of the toes, both the left and right hallux show [illegible].

Originally the [illegible] were attached to the palms by similar sheets of tissue but these were divided [illegible] six weeks before the photographs were taken. The thumbs are now fully mobile and the patient is having a series of operations to separate the digits of his hands one from another, so as to obtain maximum usage of all his fingers.

FIG. 3

Fig. 3 shows the bony fusion of the terminal phalanges of the middle and ring fingers of the left hand. Similar bony fusion occurs in the right hand.

REFERENCES

BUNNELL, STERLING (1948) Surgery of the Hand, 2nd Edit. p. 815. J. P. Lippincott & Co.

WILES, PHILIP (1949) Essentials of Orthopaedics p. 352. London: Churchill.

CONVALESCENCE

KING EDWARD VII CONVALESCENT HOME, OSBORNE, FOR OFFICERS OF THE ROYAL NAVY, ROYAL MARINES, ARMY AND ROYAL AIR FORCE

THE present building was erected as a palace for Queen Victoria in the latter part of the last century and was used extensively by Her Majesty. After her death in 1901, however, King Edward VII decided to give the Osborne estate, including Osborne House, to the nation on his coronation "to be converted into a Convalescent Home for Officers of the Navy and Army whose health has been impaired in service to their country". Later, various Orders in Council extended the list of entitled personnel to serving and retired Officers of the three fighting services, members of the Q.A.R.N.N.S., Women Officers of the Naval, Military and Air Force of the Crown, including Nurses and Commandants and Assistant Commandants of the V.A.D., established and permanent unestablished members of the Civil Service of Great Britain, Northern Ireland and Her Majesty's Colonial and Foreign Service Officers.

The house is beautifully situated on the Solent and contains a private golf links and bathing beach. In addition there are hard and grass courts, croquet lawn and bowling green, a recreation hall fitted with sound film apparatus, a library, billiards table, etc.

Osborne House possesses all the facilities and amenities for the complete rehabilitation of patients suffering from medical and surgical conditions, including massage, physiotherapy (for which a small charge is made to Officers except serving Officers and Officers recommended by the Ministry of Pensions) and special diets. There is accommodation for 50 patients, including women Officers, and bed cases can be accepted. There is a Guest House in the grounds where relatives (except very young children) of patients can be accommodated at a charge of from 6 guineas per week. Officers on the active list travelling from or to their ships, when on full pay, or from or to a Naval Hospital, are eligible to travel at Government expense.

TERMS

Serving Officers and those recommended by the Ministry of Pensions—NO CHARGE. Retired Officers, if not recommended by the Ministry of Pensions, and established Civil Servants—at present 10s. a day. These charges include accommodation and messing.

Psychiatric and incurable patients and patients with active or infective tuberculosis are not eligible for admission.

Further information may be obtained on application to the House Governor, Osborne House, East Cowes, Isle of Wight. Telegraphic address—Convalescent, Cowes. Telephone No. Cowes 251.

MEDICAL SCHOOL NEWS

Surgeon Captain (D) C J Finnigan Q H D S was promoted to Surgeon Rear-Admiral (D) and took up his appointment as Deputy Medical Director-General for Dental Services on 1st October 1957 It was particularly pleasing to the staff of the Medical School to see one of their number selected for the senior post in the Dental Branch

Surgeon Captain (D) W Holgate joined as Director of Dental Studies and Research on 9th September, 1957

Surgeon Commander W E Crocker was appointed to *President* for a D P H course on 1st October 1957

Surgeon Lieutenant Commander J S P Rawlins *M B E* joined on 4th November 1957 for duty at R N P L vice Crocker

Surgeon Captain W Forbes Guild was appointed Director of Medical Research on the 16th January vice Surgeon Captain T L Cleave who has been appointed P M O H M S *Dolphin*

Surgeon Captain J G Maguire *C B E* retired on 22nd February and was relieved by Surgeon Captain R A Graff as Medical Officer-in Charge and Director of Medical Studies

The School was visited during 1957 by

29th S O T C on 30th January

The Commander in Chief Portsmouth (Admiral Sir Guy Grantham *G C B C B E D S O*) on 5th June

The Director-General of the Turkish Naval Medical Service Surgeon Admiral Refik Kuntol on 11th July

The Mayor of Gosport (Alderman P D Blanch) on 18th July

Captain Charles T Pridgeon U S Navy Dental Corps on 24th July

Surgeon Lieutenant-Commander A Sjoekoer Indonesian Navy on 12th September

31st S O T C on 4th October

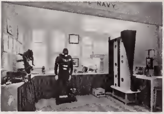
On 9th December Surgeon Lieutenant Commander J H Ebersole, U S Navy, who has been medical officer of the *Nautilus* and is still serving in nuclear powered submarines, gave a lecture on his experiences to an audience of some 85 officers

The past year has been clouded by the decision of the "Way Ahead" Committee to move the School as reported in our Spring 1957 issue Although the plans have not yet materialized the decision has made it impossible to proceed with improvements that might be made at Monckton House

Courses in the medical aspects of atomic warfare and underwater warfare and survival have continued during the year

The Royal Navy exhibit at the annual meeting of the B M A at Newcastle in July was arranged by the staff of R N P L Surgeon Commander S Miles made the following report

B.M.A. SCIENTIFIC MEETING, NEWCASTLE 195[illegible]



Each year the British Medical Association meets in some provincial town, usually a medical teaching centre, where for ten days doctors and their associates from all branches of the profession air their grievances, share their good will and hope to learn something of each others achievements. For the Naval Medical Service this annual meeting gives an opportunity to show the profession that naval medicine has many opportunities and problems of unusual interest.

In Newcastle this past year members of the staff of R.N.M.S., and R.N.P.L. presented a display of diving equipment and the physiological problems of its use. World record dives and mishaps to frogmen have made front page news in the past year and the "boffinry" behind such activities usually creates considerable interest. The resources available to the naval exhibitors are extensive and, although the planning was done at R.N.P.L., much help was obtained from H.M.S. *Reclaim*. Exhibits were also lent by the Admiralty Experimental Diving Unit of H.M.S. *Vernon*, the Museum of Messrs. Siebe Gorman and the Ministry of Supply establishment, Porton.

The latest types of naval and civilian underwater breathing apparatus were shown, with charts explaining their advantages and disadvantages. Current research in underwater physiology was displayed by charts and photographs, and working models showed the effects of depth on breathing. The advantages of mechanical packing of carbon dioxide absorbing canisters, the effects of

helium breathing on the voice and the highlights of a 600 ft dive were demonstrated

The major exhibit was a model representing the record dive of Lieutenant Wookey R.N., in 1956, to 600 feet For five days a small model diver went up and down a transparent tube of sea water alongside which port holes lit up to give short descriptions at significant stages of the dive, as the diver passed them descending and ascending Such an event was, for example the transfer to a submersible Decompression Chamber on the way up, a scale model of which was also on show

A tape recording of the telephone conversation between the surface vessel and the diver at 600 ft demonstrated very clearly the extreme distortion of the voice which occurs at such depths when the diver is breathing a mixture of 8 per cent oxygen in helium An oxygen-helium mixture was available for visitors to breathe and experience the change in their own voices This caused great interest and amusement Many deep male voices became embarrassingly high and one lady, an experienced singer reached a note a good deal higher than she had ever achieved on the concert platform

In contrast to the Diving Bell a model of a blonde in a swim suit and "aqua lung" represented a "Diving Belle," and alongside the life-size model of a fully dressed frogman was a "man frog" a preserved frog immaculately dressed in a morning suit with a bowler hat and rolled umbrella

The stand in itself was well presented and a touch of realism was added by the presence in Newcastle for the first three days of the exhibition, of the Diving Research Ship *Reclaim* Her officers and men worked very hard and organized conducted tours for visitors to whom they showed modern diving equipment and procedure whilst divers made hourly dips into the uninviting waters of the Tyne This was most popular and enjoyed by both visitors and and divers the latter appreciating the intelligent interest shown by many medical men in the personal problems of diving More than two hundred visitors went on board and a number of officers and men from the ship also visited the exhibition

Looking back over a busy week it can be said that the effort was well worth while Much was learnt from useful criticism the interest shown was greatly appreciated the chance of meeting colleagues was very welcome and off duty there was much of local interest to be seen and ample wholesome hospitality to be enjoyed

Reviews

[illegible]. By Donald F. Proctor, M.D., Assistant Professor [illegible], The Johns Hopkins University School of Medicine. [illegible] 268, with 33 illustrations. London: Baillière, Tindall and [illegible].

The author [illegible] Otolaryngology and Anesthetics has used his experience in these [illegible] to write an [illegible] book. The book is divided into four sections—General Considerations; Otolaryngological Procedures under General Anesthesia; Otolaryngological Procedures under Local Anesthesia; Other Aspects of Problems Common to Anesthesia and Otolaryngology.

While [illegible] the anesthetic procedures described would find little support nowadays [illegible] this country it must be remembered that a large number of anesthetics are given by nurse anesthetists in the U.S.A. The plea for greater understanding between the anesthetist and the surgeon, particularly in E.N.T. work where the surgeon's operative field and the anesthetist's field [illegible] such close relation, should gain wide support.

This book, [illegible] dealing with the problems of anesthesia and otolaryngology, includes the general consideration of the problems of anesthesia in all fields and should prove a useful addition to the libraries of both specialties—otolaryngology and anesthesia.

The Respiratory Muscles and the Mechanics of Breathing. By E. J. Moran Campbell, M.D., Ph.D., B.Sc.Lond., M.R.C.P.Lond., Assistant, Department of Medicine, Middlesex Hospital. Pp. xvi + 131 with 32 figures. First Edition 1958. London: Lloyd Luke (Medical Books) Ltd. Price 20s. 0d.

In recent years much work has been devoted to the study of the mechanics of respiration but the part played by the individual muscles of respiration has been largely neglected. This monograph sets out to fill this gap and all the muscles in any way concerned with respiration are described singly and collectively. A brief but adequate anatomical description is given together with a full appreciation of functional activity.

The first eight chapters are devoted to the consideration of the various groups of respiratory muscles with emphasis on function and chapter nine gives a comprehensive and welcome summary of the behaviour of these muscles. Throughout there is a generous appreciation of and reference to the opinions of other workers but the conclusions reached depend very largely upon the original work of the author who presents a technique of electromyography the results of which are sound and convincing. Details of this technique are given separately in an appendix.

The controversy which has long existed over the function of the intercostal muscles is discussed in detail. Both internal and external intercostals are shown to be primarily inspiratory though of less importance than the diaphragm. In addition they have the important function of increasing the tension of the intercostal spaces to prevent them from bulging or receding. The abdominal muscles have special attention and are described as the most important and the only indisputable muscles of expiration.

The final chapters describe the effect of resistance, limitations to breathing capacities, muscular reserves and the work of breathing under different conditions. The relationship between the elastic and muscular forces is explained by means of the pressure-volume diagram. The control of breathing is briefly mentioned though this is a complex problem outside the scope of the book.

The most pleasant aspect is the ease with which this volume may be read and understood and frequent references to clinical as well as physiological problems greatly increase its practical value. It must be read by those concerned with the mechanics of breathing and should be of great interest to anyone responsible for the management of respiratory disorders.

The numerous figures are clear and well annotated. Sub-headings are plentiful and each chapter has its own compact summary. Eight pages of references are available for those wishing further information and an index is included. Twenty shillings is a modest price for this valuable little publication.

A SYNOPSIS OF OTORHINOLARYNGOLOGY. By John F. Simpson, F.R.C.S., Ian G. Robins, F.R.C.S. and J. Chalmers Ballantyne, F.R.C.S., with a section on Neurology of the Ear, Nose and Throat by Charles H. Edwards, M.R.C.P. First Edition. 1957. Pp. xii + 443 with 88 figures. Bristol: John Wright and Sons. Price 42s. 0d.

This book is the latest addition to the well-known "Synopsis" series and is written in a similar manner.

It is illustrated by a number of good line diagrams and of these special mention may be made of the drawings of various X-ray positions for sinuses and mastoids which are particularly helpful.

The subject matter appears to be well up to date and the new procedures of tympanoplasty and myringoplasty are described.

It is perhaps surprising to a Naval Surgeon to find that diving is hardly, if at all, mentioned in connexion with barotrauma—either aural or sinus. The description as given is in connexion with flying.

Myringotomy is stated to be "necessary" in cases of otitic barotrauma if fluid is present and is also advised "as soon as fluid is detected or suspected (e.f.)" in cases of acute serous otitis media. This advice will certainly not meet with universal approval.

This book is intended—as is the case with others in the series—as a supplement to, and not as a substitute for, the standard textbooks. In general the book is to be commended and welcomed as the latest recruit to the series, and is certainly worthy of a place in the library of the otolaryngologist.

BAILLIÈRE'S NURSES' DICTIONARY. Revised by Barbara F. Cape, S.R.N., S.C.M., D.N.Lond., Sister Tutor, St. Bartholomew's Hospital, London. 14th Edition. 1957. Pp. xi + 526 with illustrations including 25 appendices. London: Baillière, Tindall and Cox Limited. Price 6s. 4d.

This is a pocket-sized, inexpensive book packed with essential information for the nurse in training and also of benefit to the trained nurse. It has been completely revised and a number of new words added. The definitions of terms are simple and adequate; their pronunciation is clearly indicated.

The appendices have been re-written and brought up to date; two new ones have been included on radiotherapy, static electricity and antistatic precautions.

The section on anaesthesia has been considerably enlarged and contains good diagrams of anaesthetic apparatus. The Holger Nielsen and Eve's Rocking methods of artificial respiration are outlined and illustrated in the chapter on first aid.

Appendices of particular value to student nurses are the ones on urine testing, common drugs and dosages, food values and dietetics. The latter section contains a number of special diets in common use. Lawrence's Line Diet has been omitted from this edition, although it would appear that it is still frequently used.

It might be said that the information given in the appendices is to be found in greater detail in general nursing textbooks, but this does not detract from the value of the dictionary as an everyday book of reference which can be carried in the pocket or handbag.

THE EPIDEMIOLOGY AND CONTROL OF MALARIA. By George Macdonald, C.M.G., M.D., F.R.C.P., Director of the Ross Institute of Tropical Medicine, Professor of Tropical Hygiene, London School of Hygiene and Tropical Medicine, Honorary Consultant in Malariology to the War Office. First Edition. 1957. Pp. xiv + 201 with 19 figures and 5 tables. London: Oxford University Press. Price 30s. 0d.

As Professor Macdonald admits in his preface his approach to the problem of malaria is individual and rather revolutionary. Even so it is logical and most refreshing.

Rarely in a medical textbook is the cold mathematical reasoning so fundamental to epidemiology presented with such artistry. In the first chapter is to be found the statement—"The aim of mathematical epidemiology is to integrate biological and circumstantial data into one coherent whole."

In fulfilment of this aim, as far as malaria is concerned, subsequent chapters consider in detail the cycles in man and mosquito, transmission factors, geographical influence, the effects of control by insecticides, prophylaxis, mosquito eradication and the little understood problem of the development of anopheline resistance to insecticides.

In the final paragraph is a simple conclusion of profound importance—"The appearance of resistance is a valid reason for attempting to convert a control programme into an eradication campaign." Vast schemes of malaria control are in operation in many parts of the world and such logical advice taken at the right moment could turn disappointment into triumph.

Though this book is written primarily for the malariologist, the novelty of its approach to the problem cannot fail to interest anyone concerned with the control and study of other epidemic diseases. It might also be recommended to the uninitiated as a masterpiece of logic which would promote new thinking on the significance of the world's most prevalent disease.

Produced in a convenient form, an orderly sequence of chapters, each a complete presentation, is followed by a more detailed mathematical treatment consolidated in an appendix as are notes on techniques and the uses of insecticides.

The index is adequate and one of the most pleasing features is the way the generous list of references is introduced with sub-headings which will help the reader greatly in his choice of further study.

BOOKS RECEIVED

FAT CONSUMPTION AND CORONARY DISEASE—AN EVOLUTIONARY ANSWER TO THIS PROBLEM. By Surgeon Captain T. L. Cleave, M.R.C.P.Lond., R.N. Pp. 40. Bristol: John Wright and Sons. Price 5s.

MODERN SEX LIFE. By Edwin W. Hirsch, M.D. Pp. 160. The New American Library of World Literature Inc., 501 Madison Avenue, New York 22, U.S.A. Price 35 cents.

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Anales De La Facultad De Medicina Montevideo. Annals of Tropical Medicine and Parasitology. British Medical Journal. Chinese Medical Journal. Chronicle of the World Health Organization. Fukushima Journal of Medical Science. Guy's Hospital Gazette. Journal of the Royal Naval Scientific Service. Kyushu Journal of Medical Science. Medical Journal of Osaka University. Middlesex Hospital Journal. Mie Medical Journal. Military Medicine. Montreal Medical. Nagoya Journal of Medical Science. Physiologia Bohemoslovenica. Proceedings of the Staff Meetings of the Mayo Clinic. Revista De Medicina Aeronautica. St. Mary's Hospital Gazette. St. Thomas's Hospital Gazette. St. Thomas's Hospital Report for 1956/57. The Australian Journal of Experimental Biology and Medical Science. The Broad Way—Westminster Hospital. The Bulletin of Tokyo Medical and Dental University. The Ghana Journal of Medical Sciences. The Journal of the Bowman Gray School of Medicine. The Journal of Nara Medical Association. The Kurume Medical Journal. The Medical Press. The Tohoku Journal of Experimental Medicine. Tropical Diseases Bulletin. University of Durham Medical Gazette. Wakayama Medical Reports. Yonago Acta Medica. Yokohama Medical Bulletin.

News of the Service

OBITUARY

Surgeon Captain H F BRIGGS R N (Rtd) died on the 18th October 1957 at the age of 72 Born on the 18th November 1884 he qualified M B B S, Edinburgh in 1907, and entered the Royal Navy as a Surgeon on the 14th May 1909 He was promoted Surgeon Lieutenant-Commander in 1915 Surgeon Commander in 1921 and in 1922 he obtained the F R C S Edinburgh Promoted Surgeon Captain in 1934 he was placed on the Retired List (Age) in 1941 and reappointed until released Class "A" on 27th May 1946

During World War I Surgeon Captain Briggs served in H M Ships *Glory* H S *Rewa*, and in R N Hospital Granton During World War II he served in R N Auxiliary Hospital Barrow Gurney H M S *Glendower* and in R N Hospital, Port Edgar

Surgeon Captain S W GRIMWADE R N (Rtd) died on the 29th November 1957, age 74 Born on the 30th January 1883 he qualified M R C S L R C P in 1906 M B, B S., London 1907 and entered the R N Medical Service as a Surgeon Lieutenant in 1910. Promoted Surgeon Lieutenant Commander in 1916 and Surgeon Commander in 1921 he was placed on the Retired List at his own request in 1932 with the rank of Surgeon Captain Two years later he obtained the F R.C S Edinburgh

During World War I Surgeon Captain Grimwade served in H M Ships *Erebus* and at R N Hospital Malta In 1919 he was awarded the *O B E.*, for valuable services and served in H M Ships *Lynx* and *Cabot* until reverted to the Retired List on the 12th January, 1941

Surgeon Commander J J KEEVIL R N (Rtd) died on the 16th December, 1957, at the early age of 56 Born on the 21st July 1901 he qualified M R C S L R C P London in 1925 and took the D T M &H the following year In 1931 he graduated M B B Chir at Cambridge and obtained the M D in 1936 He joined the Royal Navy on the 16th July, 1927 was promoted Surgeon Lieutenant-Commander in 1932 Surgeon Commander in 1937 and retired voluntarily in September 1946

During World War II Surgeon Commander Keevil served in H.M Ships *Illustrious*, *Raven*, *Implacable* *Indefatigable* and at the Medical Department. In June 1941 he was awarded the *D S O* for courage and devotion to duty in face of enemy air attacks

Keevil contributed a number of historical articles to this Journal and after his retirement he devoted himself to literary work The first volume of his main work Medicine and the Navy was reviewed in our last issue and was generally acclaimed in literary circles The second volume is already in the press but tragically the third volume had not been completed and may never be published

J L S C. writes

"In paying tribute to the memory of the late John Keevil his qualities as author and historian should not be allowed to obscure those of skill and courage which he displayed as a Naval doctor in time of war

In January 1941 H M S *Illustrious* was attacked by German aircraft and suffered extensive damage fire and flooding. The ship survived but with the loss of 125 officers and men killed and a greater number wounded On this occasion, as the Senior Medical

[illegible] Keevil's gallantry and devotion [illegible] earned him the Distinguished Service [illegible]

But [illegible] end of the story Keevil['s] courage in battle was combined with a rare p[illegible] which he exercised throughout the whole course of the action Quick [illegible] shortcomings of [the] situation he transferred his thoughts to paper [illegible] which is included in the Official Naval Medical History of the War. [illegible] on the management of the rapidly occurring medical incidents o[f] [illegible] placed a great part in enabling the Royal Navy to evolve a revised medical [illegible] which was responsible for a great saving of life during the sub[sequent] [illegible] of the war afloat "

Surgeon C[ommander] [illegible] W [illegible] WALKER R N (Rtd) died on the 28th September 1957, age 83 Born [illegible] February 1874 he qualified M B B S M R C S L.R.C.P England in 1897 and entered the Royal Navy as a Surgeon in 1900 Promoted Staff Surgeon in 1908 and Surgeon Commander in 1914 he was placed on the Retired List at his own request in 1922

During World War 1 Surgeon Commander Walker served in H M Ships *Crescent Alsatian* and in Welcome Auxiliary Hospital

HONOURS AND AWARDS

Knight of the Order of the British Empire

Surgeon Vice-Admiral R. C May *C B O B E M C Q H S* Medical Director-General of the Navy

Companion of the Order of the Bath

Surgeon Rear Admiral E T S Rudd *C B E Q H S*

Officer of the Order of the British Empire

Surgeon Commander (D) A MacDonald Watson R N

Surgeon Lieutenant-Commander D G Dalgleish R N

HIGHER DEGREES

Diploma in Medical Radiology Diagnosis—Surgeon Commanders J Lees *O B E* *R N* B Ridgway R N

Diploma in Anaesthetics—Surgeon Lieutenant R J Knight R N

Fellow Royal College of Surgeons (England)—Surgeon Lieutenant A H Tooley R N

PROMOTIONS

To Surgeon Rear Admiral—W R A Panckridge (25 3-58) as Medical Officer in Charge, R N Hospital Chatham vice Surgeon Rear Admiral D Duncan, *C B*, *O B E Q H P*

To Surgeon Lieutenant Commander—W R. Davies (24 12.57) M C H Jackson (1 12.57)

To Surgeon Lieutenant Commander (D)—J L. Edmonds (31 8 57)

The following provisional selections have been announced for promotion to date 30th June 1958

To Surgeon Captain—T F Davies I C MacDonald S H R. Price M A Rugg-Gunn.

To Surgeon Commander—W Cullen, W H B Ellis, *A F C*

To Surgeon Captain (D)—W G Finnie A MacDonald Watson *O B E*

ROYAL AUSTRALIAN NAVY

To Surgeon Captain—K. C Armstrong

To Surgeon Commander—B Crawshaw

R N V R TO DATE 31st DECEMBER 1957

To Surgeon Captain—J A Shepherd
To Surgeon Commander—H K Gray J F McHarg

R N Z N V R TO DATE 31st DECEMBER 1957

To Surgeon Commander (D)—J F Tate

TRANSFERS TO PERMANENT LIST

Surgeon Lieutenants R W F Paul O O McCarthy
Surgeon Lieutenants (D)—D A Coppock A Moore C T Stacey

ENTRIES FOR SHORT SERVICE COMMISSION

E P Beck M B Ch B M P Brady M B Ch B E C Bramwell M B B Ch C Brough M B Ch B F P A Cripps M B B S P L Cook M B B S M R C S L R C P R P Doherty M B B S D H Elliott M B B S M Fletcher M B B Ch J P Giles M R C S L R C P A L Horton M B Ch B I A Hunter M B B S M J Inman M B B S M R C S L R C P K P S Lumley M B B Ch W F Millner M B B S R R Welsh M B B S M G Williams M B B Ch M R C S L R C P D J Willsher M B B S M R C P L R C S P E H Wilson M B B S J W Gilbert B D S L D S W A Humpherson B D S L D S P S C Maudsley L D S

TRANSFERS TO SHORT SERVICE COMMISSION

Temporary Acting Surgeon Lieutenants A E Cameron H R MacDonald J M Young

RETIREMENTS

Surgeon Rear-Admiral A A Pomfret, *C B O B E, Q H S*
Surgeon Rear Admiral (D) L B Osborne *C B Q H D S*
Surgeon Captains E B Pollard *Q H S* E W Bingham *O B E*
Surgeon Commander J W L Crosfill
Surgeon Lieutenants—J D Beeson D G Bluett N H Brodie G R Carroll H S Heap D S Jones Patricia MacDonald C D Waltham Weeks

WARDMASTER OFFICERS

PROMOTIONS

To Acting Wardmaster Lieutenant—W Jones (1 10 57) J A E Lihou (1 10 57)
To Acting Wardmaster Sub Lieutenant—R E Fay S B C P O P/MX/ 57337 (16 10 57) W J Harrington S B C P O C/MX 54955 (3 9 57) G O Jones S B C P O C/MX 59602 (4 11 57).

RETIREMENTS

Wardmaster Lieutenants—S G Allard H Hodgkinson T Jones *B E M* T G Rutherford *D S M*

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

HONOURS AND AWARDS

Member (2nd Class) of the Royal Red Cross

Superintending Sister Miss M M Gallagh
Senior Nursing Sister Miss C Thompson

PROMOTIONS

To Superintending Sister—Miss S M Houston Miss E. C MacDonald Miss B Magson

RE-ENTRY

Senior Nursing Sister Miss M M Ashby

RETIREMENTS

Principal Matron Miss M E Cawston *O B E R R C*
Superintending Sister Miss P L Shipton *A R R C*

JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE
ANNUAL REPORT: 1957

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F WILD,
Supply Lieutenant (W) R N

ERRATA

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Page 201 Table III *For* meg/litre *read* meq/litre

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Page 208 Figure 4 Last sentence of subscript *for* normally *read* maximally

ADMIRALTY FLEET ORDERS—1957

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2501 —Medical—Documents of Personnel Attending Central Air Medical Board—Transmission

2568.—Surgeons and Agents

2587 —Books—Medical—Service Afloat Medical Library—Addition of Text Book on Bacteriology

2601 —Establishments—R N Hospital, Portland—Transfer to Ministry of Health

2611 —Medical and Dental Treatment—Reciprocal Arrangements for British and Canadian Servicemen

2616 —Ratings—Sick Berth Ratings—Specialist Training

2671 —Medical—Care of Hearing—Protection from High Intensity Noise.

2672.—Medical—Paint Spraying—Precautions.

2682.—Examinations—Sick Berth Ratings—Examination for Advancement to L S.B.A and S B.A in Dispensing—Temporary Relaxation of Standard

2704.—Medical Stores—Service Afloat X ray Apparatus—Care of

2785 —Establishments—R N Hospital, Portland—Transfer to Ministry of Health

2802.—Medical, Dental and Hospital Consultants

2803 —Medical—Eyesight—Spectacles—Replacements or Repairs Caused by Carelessness.

2816 —Dental—Supply of Dentures to Naval Personnel and Entitled Civilians—Procedure As To Recovery of Charges.

2924.—Admiralty Surgeons and Agents—Appointments (Form S 582)

2942 —Medical, Dental and Hospital Consultants.

2994 —Medical, Dental and Hospital Consultants

3066.—Medical—Miniature Film Radiographs—Compilation and Disposal of Records.

3067 —Medical—R N Medical Bulletin—Issue No. 5—Distribution.

3102 —Medical Stores—R N Blood Transfusion Units

3127 —Courses—Officers—Medical Officers—Courses in Medical Aspects of Underwater Warfare and Survival at Sea in 1958

3136 —Medical—R.F.R and R N.S.R Personnel—Notation of Pulheems Profiles

3161 —Medical Stores—Barbiturates, Antihistamines and Methylpentynol—Dispensing.

3203 —Surgeons and Agents

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THE EDITOR

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R N Medical School Alverstoke, Hants

VOLUME XLIV SPRING 1958 No 2

Journal of the Royal Naval Medical Service

Articles

SOME ENCOURAGEMENTS FROM MEDICAL AND SURGICAL WORK CARRIED OUT AS A P.O.W. IN THE FAR EAST

From 25 12 41 until the end of August, 1945

BY

Surgeon Captain H L CLEAVE, R.N.

IT is embarrassing to write this little essay in the first person as it will inevitably sound egotistical but I am well aware that similar difficulties, or far worse must have been encountered in Malaya and elsewhere Nevertheless it is a record of what can happen to men living under primitive conditions and on an unnatural diet and of the medical and surgical relief that it may be possible to give them

My records on leaving Hong Kong for Japan were confiscated by the Japanese, so that the account of the cases treated in Hong Kong is from memory, but it has been checked up carefully where possible The records for the time spent in Shinagawa P O W Hospital Tokyo are complete It will be more interesting if the conditions of the two P O W camps are very briefly described so that the background of the work can be appreciated

Taken prisoner while holding the posts of surgical specialist at, and Medical Officer-in-Charge of the Royal Naval Hospital, Hong Kong, on 25th December, 1941 I had two preliminary moves before arriving at the officers' camp at Argyle Street in Kowloon Hong Kong in May 1942 I remained there until May 1944 when with eight other medical officers I left for Japan This camp had been occupied early in April 1942, before our arrival, and much had been done by officers and ratings to improve it in every way possible with the meagre facilities available to them

Argyle Street Camp, Hong Kong consisted of eleven wooden sleeping huts a cookhouse hut and bakery hut Outside the main camp were two additional

huts which after many requests we were finally allowed to use as hospital huts for isolation and treatment of the worst cases. All bunks were of plain wood. The P.O.W. had to produce and carry his own bedding. At each stage of his captivity a P.O.W. had to carry all his belongings—no matter how weak or sick—so that clothing and bedding were very scanty. This led to a reversal of the normal preference in Hong Kong for the winter to the summer. The number of beds varied slightly in each hut, roughly they held 40 beds each with 2–3 feet between each pair of beds.

The camp site was in some respects unfortunate as the large dusty parade ground lay on the windward side so the huts and food were constantly covered in windy weather with a fine dust which was undoubtedly responsible for spreading much of the bacillary dysentery. In 1942 Hong Kong had a severe plague of flies due to the breakdown in the sanitation system. Flies were seen in unbelievable numbers.

The camp personnel consisted of officers of the R.N., R.N.V.R., R.N.Z.N.V.R., Hong Kong R.N.V.R. and Dockyard Defence Corps, Officers of the Middlesex Regiment, Royal Scots and Royal Engineers, and later on Canadian officers from the Winnipeg Grenadiers and the Royal Rifles of Canada, I.M.S. doctors and officers from two Indian regiments, the 2/14 Punjabs and 5/7 Rajputs, members of the Hong Kong Volunteer Defence Corps, and about 40 other ranks and ratings who were employed in the cookhouse etc. The total number of P.O.W.s varied from time to time due to drafts in and out, but was between 450 and 580 men.

Diet consisted of boiled white polished broken rice of the coolie grade—there are many grades of rice according to size of grain and the extent the grain has been broken in the threshing. The more broken smaller grains easily become a soggy repulsive mass on cooking. Some rice meals were replaced by bread meals. Bread was baked in the oven made in the camp and we had about three bread meals a week. The bread was a very light brown colour.

The vegetables varied from year to year and according to the season. In 1942 we had many sweet potatoes—a valuable addition which became rapidly scarcer. "Greens" consisted of the various types of Chinese cabbage and spinach and ever-increasing amounts of chrysanthemums. In all fairness it must be stated that in the writer's opinion the Chinese "White" cabbage is unsurpassable for flavour. In summer we had also the acceptable egg plant (Aubergine). We also had frequent supplies of a very large white radish (Daikon) which on boiling produced a most offensive smell and a most offensive flatus.

Boiled soya bean meals replaced the rice about twice a week. Soya beans require very prolonged boiling and even then are most indigestible. Animal protein consisted of boiled and latterly baked fish which was dealt out to the huts in rotation as there was never enough to go round more than two to three huts at a time. The fish meal occurred about once every ten days and the ration was about six ounces.

Plain tea was supplied two to three times a day according to the fuel situation. Peanut oil and later on some ghee were provided each month. Peanut

oil is excellent in flavour and practice, but ghee—Indian butter purified by heating—produces diarrhœa until the body gets used to it. We also had a small ration of sugar each month.

It must be emphasized that the diet showed a progressive decrease in quantity and quality all the time that the camp was occupied from 18th April 1942 until 20th May 1944. For example the sweet potato supply soon ceased for all practical purposes while the chrysanthemum issues became larger and more frequent. More important, the quantity and quality of the fish deteriorated. The fish supplied became increasingly frequently the Canton Mud Fish. This fish looks splendid, but it has a taste that makes it inedible even to very hungry white men. After many experiments we turned it into a bouillabaisse heavily flavoured with curry powder. The soup was consumed by about half the camp and the other half lacked not only the soup but the vegetables that were put into it. Also when a really first-class fish was supplied—and some of the best fish in the world is found round Hong Kong—it was often in a decomposing state and had to be buried at once. This disheartening scene was witnessed many times. However, the contractor had fulfilled his contract to supply so much fish a week.

The caloric value of this diet varied from 2,000 calories a day at the start and working down to 1,000 calories at times in 1944. The rations were delivered once a month. We then worked out the daily ration of rice, frequency of bread meals and the amount of peanut oil we could issue to each P.O.W. A little food came into the camp via the canteen in 1942 and 1943, but after that the food from this source was negligible. The canteen continued to supply cigarettes and curry powder, soya bean sauce, and condiments.

From about the middle of 1943 until the camp was evacuated a more valuable extraneous source of food was by food parcels. These were delivered in small sacks to the Japanese camp headquarters outside our camp once a week. After scrutiny and frequent removal of some items the parcels were brought into the camp. The P.O.W. recipients were the lucky few who had certain contacts in Hong Kong. We were allowed to send money out to these contacts who suffered many indignities and great personal hardship in their errands of mercy. The parcels were widely distributed in the camp as P.O.W.s clubbed together to send out their money to these contacts. Much money also left the camp for the civilian internment camp at Stanley in Hong Kong where many officers had relations and dependants and where the conditions were very bad.

Our final source of food was the camp garden and bird farm. Volunteers broke up terrible ground and produced tomatoes, sweet potatoes, lettuce, etc. Alongside this we made a small fowl and duck farm. We bought the usual Chinese type and Leghorn fowls and ducks. The Leghorn fowls soon died of a fowl cholera epidemic but the Chinese fowls and the ducks did very well. Latterly a good deal of thieving went on by the starving populace under the eyes of the Jap guards, which was very disheartening. The eggs were reserved exclusively for the sick.

The cookhouse merits a few words since it occupied such a large place in our daily thoughts. It contained three large kongs—in other words three small fire boxes for three large open boilers for which we made wooden removable tops. They exactly resembled very large coppers that used to be in all big houses for the family laundry. Two were used for rice and one for the vegetable soup. Outside the cookhouse was a smaller separate kong for boiling water for making tea.

Fuel was a constant, ever growing anxiety. Large logs were supplied which had to be axed into the correct size by volunteers. The logs were then stacked at the back of the kongs along the exhaust flues so as to dry the wood and make it last longer. The wood became frequently camphor wood. This gave off a most irritating vapour while it was burning, and the cooks always had streaming eyes. We frequently missed meals because, although we had the rice, there was no wood with which to cook it. It is not too much to say that the fuel supply was almost as great a worry as the food supply. Several times the camp went without rice for twenty-four hours because we had no fuel. The hot-water boiler for the tea was run all through the summer months on dry grass gathered from the neighbouring hillside by a band of volunteers who were allowed out for this purpose. Hot plain tea made a great difference to morale.

As the rice issued monthly to us became smaller and smaller we had to decrease the ration served at each meal and what was much worse we had to make one or two meals each day of rice porridge—a rice ground up and made into a thin type of porridge. The water was rapidly excreted of course.

I write with some knowledge on the diet and cooking, as in 1944 I was elected for three months as the sole naval and medical representative on the messing committee. This consisted of the messing officer in charge of the cooks and the actual cooking, an army officer, one other rank, and myself, and for my last two months remained as medical representative on the committee.

All personal washing was done from cold showers. The latrines were of the squatting oriental type, but luckily we did have drainage and not cesspits.

Officers were paid in military yen according to their rank but very rapidly a scheme was evolved whereby all senior officers who had above a certain sum were taxed the rest of their yen for a fund which paid yen to the junior officers. This sum was necessary to allow the juniors to participate in the canteen and then, when this failed, in the food parcels scheme. Without the additional help from these sources their deficiency diseases would have become much more severe.

This completes a bare description of our camp, the personnel and the diet, etc.

There were eleven doctors in the camp. Medical meetings were held periodically to discuss our problems and the best means of dealing with them. Lieutenant-Colonel Shackleton, R.A.M.C., was the senior army doctor, and Surgeon Commander Tincker, R.N.V.R., was the senior naval one. For the naval side of the camp Surgeon Commander Tincker, R.N.V.R., did all the

clerical work The Japanese demanded complicated lists before roll call each morning and evening.

Surgeon Lieutenant Dawson-Grove H K R N V R and I ran the sick bay Dawson Grove is a well known and much loved physician in Hong Kong with whom from this time until our final release in Tokyo I worked with utmost confidence and friendship

The sick bay merely a cabin at one end of one of the wooden huts had an electric sterilizer and some shelves The volunteer dresser D C Longeraine H K V D C slept there so as to protect our small stock of drugs Each doctor had carried into camp some items of medical equipment Doctors were frequently drafted but most of the time there were three naval five army, and three I M S doctors

For drugs we were very badly off We were indeed fortunate to have some thiamin which had been sent into the camp by a devious route by Dr (now Sir) Selwyn Clarke D M S of Hong Kong, who did untold splendid work during all his captivity He also sent us in some peanut butter for the treatment of our pellagra cases The Japanese supplied us at infrequent intervals with some drugs which were usually not what we asked for, many bottles of phenol would be sent in Later on they did supply a little thiamin As an example of how they would not help us in the simplest matters one instance will suffice In 1943 there was a severe widespread outbreak of scabies, for which we had no sulphur ointment Repeated requests to the Japanese produced none so finally we got it via the food parcels by asking for sulphur butter It was sent in labelled as peanut butter

The army medical officers worked in the M I room as they called it, from 9 a m to 11 a m and then Dawson Grove and I took over for the naval sick We worked side by side The medical side of this work will be described briefly

Patients reported with the usual minor ailments but in addition we were plagued by the following specific P O W complaints Vitamin-B deficiency in all its forms—and at that time the symptoms due to each exact component of the B complex had not been worked out—was rampant Electric or burning feet which made the nights hideous as any warmth aggravated the pain red scrotal dermatitis which sometimes became exfoliative, causing severe pruritus glossitis and dysphagia were common and made swallowing the rice diet very painful true beri-beri in most of its forms pellagra and cheilosis due to riboflavine deficiency were all seen

The following efforts were made to obtain extra vitamins of the B complex A yeast culture was procured and after a few initial errors was kept alive and vigorous for the rest of the stay at Argyle Street The yeast was cultured in two large wooden buckets which were kept warm at the back of the kongs in the cookhouse One bucket was dispensed each day as a ration to the whole camp—we lined up mug in hand Deficiency cases received a double ration The empty bucket was then half-filled from the remaining bucket and both were

topped up with water and flour and sugar were added to each bucket. By next day the yeast had become thick and creamy again.

The cooking of the vegetables was done under the supervision of an officer. Vegetables were cut up and then put into boiling water. The lid was replaced and the boiler brought back to the boil as rapidly as possible, and kept on the boil for exactly ten minutes. This was a compromise. We knew that the vegetables had been grown on human manure—the use of nightsoil is traditional in China—and so with that contamination, the handling in its preparation, together with the dust and flies, it must have harboured the various dysentery organisms. Twenty minutes boiling was recommended in the textbooks, but we could not risk so great a destruction of our chief source of vitamins. No case of scurvy was ever seen. Diarrhœa was common, but severe dysentery much less so.

A small supply of eggs came into the camp. For a few months the canteen supplied small Chinese eggs—one egg per person for about one-third of the camp each week. The supply soon stopped, but then the food parcels were organized and produced some ducks' eggs. Finally our hen and duck runs in the camp garden were a mighty help. All eggs from any source were eaten raw, being stirred up in the rice. After an initial grouse the members of the camp accepted this medical advice most manfully, and soon got used to this dish. Soya bean sauce was excellent as a flavouring agent.

Another source of vitamins was the fruit—bananas, paw-paws and persimmons—which came in the food parcels. Lucky recipients were punctilious in putting a portion of their fruit into a pool, which was distributed by the doctors to the deficiency cases.

Considering the fact that we were living on a pure white rice diet—often as low as 1,000 calories—the health of the camp was amazingly good. The writer feels sure that this was partly due to the very strenuous efforts for increasing the vitamin supply from all possible sources, and to seeing that it was so fairly allocated.

Starvation œdema of the legs was very common and did not respond to thiamin. Eye symptoms became increasingly frequent and severe, and consisted of diplopia, haziness of vision, and inability to read owing to the rapid onset of eyestrain and fatigue and seeing the print in a jumbled manner, with missing letters. The inability to read was a great hardship to the older members, who had much unoccupied time, due to not being fit enough to work in the camp gardens and at other camp duties.

Dysentery occurred, but as we had no microscope it was impossible to be sure of the exact type. We also had several specific outbreaks of acute food poisoning from bad fish or other food, which produced forty to eighty cases of cramps and diarrhœa, making people too ill to attend roll call.

There were two cholera scares, but although not familiar with true cholera I remain unconvinced that we had cholera in the camp. The Japanese took stool specimens from two cases of fulminating dysentery at different periods and reported both as cholera. Much unhappiness was then caused by segre-

gating the hut from which each case had come and by the insertion of a glass rod into the anal canal of every single P O W for stool examination purposes

For the treatment of dysentery in all its forms we had a little sulphapyridine and sulphanilamide which had been brought in by the doctors It was reserved for the very worst cases

The extreme rarity of pneumonia and broncho-pneumonia in Hong Kong, compared to our later experience in Tokyo, was striking and was due to the milder climate and the better construction of the Hong Kong camp huts Malaria, as first attacks or relapses, was fairly frequent, and responded to quinine and atebrine We had two cases of diphtheria, but luckily they reported early, were diagnosed early, and recovered We had no anti-serum The camp was throat swabbed by the Japanese Luckily we were spared the extensive epidemic that occurred at the neighbouring camp for ratings and other ranks at Shamshuipo, where there were many deaths from this cause

Ascaris lumbricoides was widespread as was to be expected Luckily we had some santonin

The surgical work consisted, apart from the operations to be described, of the usual septic conditions such as boils carbuncles otitis externa and whitlows, etc However ulceration of the legs and feet deserves special mention These ulcers were due, we believed, to minor traumata acting on devitalized skin. Everybody had a marked drying and scaling of the skin on this diet, which had such a very low proportion of fat The ulcers were shallow and tended to spread superficially rather than deeply unless they were allowed to crust over Such ulcers would have presented no problem in civilian life but they were a very real problem to us They occurred most frequently on the shin and inner side of the leg Treatment with saline or weak sodium sulphate or 5 per cent gentian violet compresses would render the ulcer clean The ulceration would then become chronic and if allowed to form a crust—the obvious natural treatment—a disappointment lay in store for the patient after seven to ten days the crust fell off to reveal not a healed surface but a slightly deeper ulcer than before Unless these ulcers were kept protected and moist from a compress until completely healed they would relapse This treatment was tried and found to be the only one successful—analogous to a dog licking a sore

Superficial septic lesions were common and were opened with a razor blade, without anaesthesia—and then promptly healed This was a contrast to the ulceration mentioned above

Shoes rapidly wore out and so wooden camp made clogs or bare feet were the rule A case of epidermophytosis was never seen The dust of the camp kept the interdigital clefts dry, and therefore unfavourable to fungi The civilization deformities of the feet—so common and so very unattractive in Europeans—did not disappear of course but they gave no further trouble

The hospital which officially took our cases was the British Military Hospital at Bowen Road Hong Kong This meant that the Japanese had to arrange transport from Argyle Street camp on the mainland to the transport boat and from the boat up to the Bowen Road hospital on Hong Kong island

This gave them some trouble. Moreover, as a race they are terribly suspicious. We thought that they felt that one camp would encourage the other and exchange any information that had leaked in. In any case they were most loath to transfer our sick to the Military Hospital. We regularly gave them sick lists for transfer, but when at last the transfer was arranged some of the original sick were better and fresh sick were not allowed to be substituted. It was therefore certain that if an acute surgical emergency arose we ourselves should have, in some way, to deal with it. There were a few instruments in the camp—brought in by Surgeon Commander Tucker, R.N.V.R.—and several doctors had brought over a few tubes of catgut and some needles and thread.

The writer feared that at some stage in his captivity he would find himself without an anæsthetist and still be expected to do surgery. He had brought some phials of sodium evipan, a syringe and needles, a fine spinal needle and some phials of 1 in 1,500 Nupercaine. These were to prove of great value.

During the summer of 1942 our first case of appendicitis occurred in a naval rating. The Japanese were asked to transfer him to the Bowen Road Military Hospital. They refused, but instructed us to do the operation at the Indian P.O.W. camp. This P.O.W. camp lay one-third of a mile distant from our camp, and the road went downhill all the way to it. The P.O.W.s here were the Indian other ranks and N.C.O.s from the 2/14 Punjabs and 5/7 Rajputs, who would not turn over to the Japanese (who ceaselessly tried to induce them to do this). These loyal Indians were treated most harshly. There were many deaths in their camp.

Their camp had a large sick bay with two sterilizers and an operating theatre table. Our patient was carried down to this camp on a stretcher by four volunteers. Captain Strahan, I.M.S., gave the anæsthetic—there was some ether and a mask in the Indian camp—and Captain Woodward, I.M.S., assisted me. The operation went uneventfully and was necessary. A razor blade was used for a knife and Lieutenant A. H. Cobb, H.K.R.N.V.R., very kindly lent me his nail scissors, as I had none. The patient was carried back to our camp and made a quick recovery.

Our second case occurred in the winter months. An army captain had a perforated duodenal ulcer. The same procedure was followed, but he was not a very robust type and suffered much pain from the jolting trip. The sick bay was unheated. All these factors and the operation combined to produce much shock. It was decided to leave him in the camp that night to increase his chance of recovery. The Japanese corporal agreed to this proposal. Next morning the patient was brought back to our camp. He developed some bronchitis, but after that made an excellent recovery and had no further ulcer symptoms while I remained in Hong Kong.

Captain Saito, Imperial Nipponese Army, was in charge of all the medical arrangements for our camp, but he took only the slightest interest in us and we saw him infrequently. When Captain Saito learned that the patient had remained overnight in the Indian P.O.W. camp he was very angry indeed, and this probably led to the change in procedure for the next operation.

Shortly afterwards we had another perforated duodenal ulcer from the army section in a patient who knew that he had a duodenal ulcer. At the last moment Captain Saito told us that only the surgeon and anæsthetist could take the patient to the Indian camp. This meant that Captain Strahan and I had to carry him uphill back again. It was an exhausting business and very hard on the hands. The patient did very well, but Strahan and I were determined not to get caught again, so we had made in the camp two leather slings with loops for the handles of the stretcher. We were thus able to carry the stretcher from our shoulders for the next case.

This case was a lieutenant in the Hong Kong Volunteer Defence Corps—a man of 60—who perforated in the summer months. He had auricular fibrillation and was a frail subject. Strahan and I carried him down, and I operated as before while Strahan anæsthetized. The patient recovered well for a time, but died a month later from a subphrenic abscess. This was the only case that I lost doing surgery in Hong Kong and Tokyo. We knew this patient probably had a subphrenic, and were able to get him transferred to the Bowen Road Hospital a fortnight or more before he died.

We thus had three cases of proved perforated duodenal ulcer in about one year in a camp of about 400–500 men. As I never saw or heard of a perforated peptic ulcer in over a year as a P.O.W. surgeon in Tokyo, the factor of mental stress can probably be excluded, as life in Tokyo was infinitely harder than it ever was in Hong Kong. The cause was probably the white rice diet. Our ration of cigarettes in Hong Kong and Tokyo was very meagre and similar, but the difference in our diet was very great—as will be explained later.

Our next emergency was a stoker suffering from atypical appendicitis. He had colic and suprapubic tenderness. After forty-eight hours' observation he was reported to the Japanese, who agreed to our carrying him down to the Indian camp. At operation I found ileal obstruction due to a Meckel's diverticulum. This was the size of a man's thumb, and was folded back on itself, being attached at its apex to the root of the mesentery. This kinked the ileum. After freeing the apical adhesions the intestinal continuity was restored. As we had no intestinal clamps of any sort it was considered wise not to attempt to excise it. The patient made a speedy recovery and was warned later of his pathology. Recently I saw him in London at a reunion dinner, and learned that he had never had any further abdominal symptoms.

Our next patient was a man of about 50 in the Hong Kong R.N.V.R. In civilian life he had long been a private patient for hyperpiesia of Surgeon Lieutenant Dawson-Grove, H.K. R.N.V.R. He was sleeping in the next bunk to his doctor. Dawson Grove awoke me about 10 p.m. one night because he believed the patient had a perforated peptic ulcer. The diagnosis seemed certain to both of us. The Japanese were informed, but after a long delay Captain Saito sent a message that the patient could be transferred to the Indian camp next morning. This decision appeared to us to amount almost to a death sentence. We therefore boiled our few instruments in the cookhouse and operated on the patient in our isolation hut, under a spinal anæsthetic

The patient did not have a perforated peptic ulcer. However, the sequel is most interesting. He had a stormy convalescence, developing an abdominal mass which eventually discharged through the incision. The abscess contained quantities of peanut oil, which was unmistakable. The patient's post-operative diet had been rice ground up and cooked to the consistency of a thin porridge, and then mixed with peanut oil. Once the abscess had discharged the patient recovered.

We believed that I had missed a piece of glass, which was working its way through the bowel at some point. This is not as unreasonable as it sounds. Very shortly before this the camp had been supplied with rice containing many pieces of glass fragments of all shapes and sizes—presumably rice from a bombed "Go-down." The whole camp was alarmed at this vicious rice. Later we completely solved this problem by the simple solution of washing all our rice on an inclined wooden shute which had little steps set all the way down—a commonly used method for separating gold dust from soil. In our case the rice was washed down and grit and glass were left in the angles formed by the steps. At the time of this case we were eating rice with spikes of glass, taking a long time over the meal and ejecting the longer spikes.

Our final abdominal case was one of acute appendicitis in an R A M C orderly, which Captain Woodward, I M S, did in our own camp, I believe under a spinal. The patient was soon back at work. I did one other operation in this same hut under spinal anæsthesia. This last case was one of very severe longstanding 3rd degree hæmorrhoids which were excised in the usual manner. This camp baker was a most grateful patient.

Shortly after this operation the writer left the camp for Tokyo. One's abiding memory of the medical work at Argyle Street Camp is one of struggling against lack of equipment and supplies. The Japanese did not interfere with the medical work, and in fact showed almost a complete indifference to it, except when the question of cholera and diphtheria arose, and for the endless forms and classifications which they demanded.

The conditions in Tokyo were almost the exact reverse of this. Here the Japanese interfered with the running of the camp hospital at every point and would not allow us to exercise our discretion in using the meagre medicines which they dispensed to us from the large store of Red Cross medicines actually available in the camp's storerooms.

My other abiding memory is of the great friends I made among the other doctors in Argyle Street, and of how completely free from bickering was the medical set-up there.

Early in May, 1944, together with eight other medical officers, I left Argyle Street at half an hour's notice with such remaining gear as we could carry. For ten days we stayed at Shamshuipo, a ratings and other ranks camp in Hong Kong, and then a draft was formed of between 300 and 400 P O W s, the nine doctors from Argyle Street and one other from Shamshuipo. We sailed for Japan and reached Osaka in June after stopping at Formosa *en route*. The ship was carrying scrap metal to Japan. We were crowded into one of the

ship's holds. Platforms had been made about 12 feet wide. We lay side by side in rows facing each other, feet to feet. In the centre of the hold lay a pile of all our gear. We had no escort and were lucky to reach Osaka without incident. It may be recalled that the Lisbon Maru was torpedoed on such a trip in 1942 with the loss of 840 P O W s.

Dysentery was rife. We were very thankful to entrain for Tokyo where all the doctors and some R A M C orderlies left the draft for Shinagawa camp-hospital. Here I stayed until liberated, and will describe the life and work in this hospital which in 1945 became steadily more like a work camp.

Shinagawa was placed on a small island not far from a main railway terminus in Tokyo. To call it a hospital is to emphasize function rather than structure. At one time it had, in fact been an ordinary work camp. It consisted of five long wooden huts for the treatment of the sick a stores hut and a house where the Japanese N C O s and privates and one of the two interpreters lived. Each hut for the sick contained four large rooms two little cabins at the front end—one for the doctors and one for the orderlies—and latrines at the other end. A corridor ran at one side of the hut from front to back. Sliding doors separated it from the sick rooms. Each room for the patients had a raised platform about 7 feet wide covered with straw Tatame mats. This platform ran right round the room except for the door side. The door led from the corridor into a space in the centre of the room which was about two feet below the platform, which was used for sleeping and living purposes. Patients kicked off their clogs before mounting the platform.

The Tatame straw mats were about 7 feet long by 3 feet wide. There were about eleven in each room. One slept with one's head to the wall and one's feet towards the centre of the room. These straw mats were infested by fleas in the summer and lice in the winter. The cracks in the wooden walls and ceilings harboured myriads of bed bugs. Mosquitoes were numerous in the summer. Our nights were much broken up by all these insects added to which in 1945 there were frequent air-raid warnings. In contrast to Hong Kong I can state that every member of Shinagawa felt perpetually exhausted. The latrines were of the squatting type. The dejecta passed through a hole in the floor into a concrete lined trench that ran underneath for the width of the hut and which was a perfect breeding place for a great mass of flies. Keeping the latrines clean was a wellnigh insoluble problem—there was no lighting at night—and many were the misfortunes that occurred there. The trenches were partially emptied periodically from outside the hut by dipping out the contents with a wooden bucket fixed to the end of a wooden pole. The contents were taken to the vegetable garden at once. Occasionally an outside firm came in to empty the latrines, but these visits almost ceased in 1945.

All the huts were made of thin wood which was old and full of holes. This made the huts terribly cold and draughty in the bitter winter months. There was no form of heat. Neither was there any water in any hut. All washing was done at two wooden washstands. Each ran almost full length between two of the huts—at opposite ends and sides of the camp. One side of one of the wash

places was reserved for the tuberculous cases The Japanese still had their ... little hut with a central, large, Japanese-type wooden bath heated ... In the winter of 1944 we were allowed to reconstruct a similar one which had become derelict The central bath tub was about 4 feet deep and the temperature of the water was raised as high as it could possibly be borne Washing was first done at one side of the bath hut with the use of little wooden oval buckets, filled from the central tub Then about six to eight people at a time entered the central big bath by climbing up some steps at the side Each batch was allowed about 5′ in the bath First the doctors entered, then the orderlies and finally the ambulatory patients We had one bath each most weeks and it was undoubtedly the highlight of each week. One felt really warm for about two hours after this In summer one could wash with cold water as often as one wished.

Incidentally the camp was swarming with rats In the cold winter nights they were continually scurrying about the rooms and often over one, and on occasions I have been woken in the winter, as I lay in my blanket-roll, by a rat pulling at my hair

As already stated, the Japanese headquarters was a house just inside the gate In it worked eight other ranks and two interpreters, and Captain Tokuda and Captain Saito, who lived outside Shinagawa

The medical staff, when we arrived consisted of Lieutenant Gottlieb U S N , Medical Specialist, Captain Weinstein, U S A Surgical Specialist, Captain Keschner U S A , Pathologist Captain Clayman U S A , Lieutenant Davis U S N , C E C , and Lieutenant Mohnac U S A., D C , Dental Officer and qualified Anaesthetist Of the nine doctors from Hong Kong all were gradually drafted to P O W camps in Tokyo Yokohama and Northern Japan except for Captain Warrack Surgeon Lieutenant Dawson-Grove and the writer We three stayed in Shinagawa until liberated Warrack was put in charge of the dysentery hut Dawson-Grove of the tuberculosis hut, and I—after treatment for amœbic dysentery—shared the surgical work with Captain Weinstein However, about the end of August, 1944 Captain Weinstein left for Omori—headquarters for P O W s in Tokyo—where his ability and splendid morale were much appreciated After his departure I was responsible for the surgery

We had about 22 orderlies from the United States Navy and United States Army R A M C , and two British other ranks who had been proved to have initiative and energy far beyond the average The number of patients varied greatly from time to time, but the average was between 160 and 200 They came from all nationalities fighting for the Allies and had been captured from all the fighting zones in the Far East A few words must be devoted to our two carpenters because we owed so much to them Harry Petterson Scandinavian engineer, electrical engineer and designer, had been captured at sea by a German raider while working in a British ship He was interned in Shinagawa His immense ingenuity and ability enabled him to design and make much of our medical and camp equipment from the most meagre material imaginable,

Corporal Bowen, R E , A I F was a professional Australian carpenter His skill and hard work were beyond praise

The drugs at Shinagawa were all of American Red Cross origin and were of a high quality We were only allowed to prescribe within certain limits—defined and checked by Captain Tokuda The total allowed each day was drawn by an American naval orderly from the Japanese sergeant in charge of the drug store We were also allowed to give plasma infusions with Japanese authority Bandages were issued infrequently The rule was that all bandages had to be washed, boiled and used again until they finally became mere tattered fragments

Just outside the hospital gate was a warehouse bursting with Red Cross clothing and food parcels and other stores The Japanese would not give them out except at rare intervals in trivial amounts One instance will suffice to illustrate this state A draft of P O W s arrived in the winter of 1944/45 Their ship had been torpedoed *en route* to Japan from the Philippines They had travelled from Osaka in their underclothes and shirts with one blanket each They could not stop shivering violently even for a few seconds Captain Tokuda examined them individually in a most leisurely manner No clothes were issued to them We had to collect every available spare scrap of our own clothing for this purpose After the capitulation the Japanese became frightened and issued clothing—when it was too late

In the winter of 1944 we were twice issued with American Red Cross food parcels These issues worked out at one per man, and a few over which made a bank for the most desperate cases

The diet in Tokyo as in Hong Kong became progressively worse in quantity and quality Two Japanese other ranks were in charge of the storehouse and cookhouse They issued the rations daily There were six Allied other ranks cooks who did the actual cooking—even for the Japanese—but the doctors were not allowed to advise and regulate the meals in any way We were forbidden to enter the kitchen It was a great contrast to Hong Kong where we always felt that we were making the very best of our meagre rations I would guess that the diet produced between 1 500 and 2 000 calories a day but patients who could not work were on a smaller ration and from 1945 the tuberculous patients were on half rations[1] In 1945 all up-patients and staff had to do heavy manual labour The diet consisted basically of rice millet and barley These were much less milled than the white rice of Hong Kong Soya beans were supplied more frequently than in Hong Kong The quantity and quality of the vegetables were much inferior

The standard meal was made up of soup and either rice barley millet mixture or soya beans or bread or new potatoes The soup was flavoured with bones when these were available—about three times a week—and Mesu (a salty paste derived from soya beans) with a few beans and the vegetables The vegetables varied according to the season The winter vegetable was the large white radish (Daikon) as in Hong Kong the summer mainstay was sliced pumpkin but in summer we also had green vegetables grown in the camp

gardens. The new potatoes as the second course were disliked because, although pleasant to eat, the water in them was rapidly excreted, leaving one feeling weak and hungry. The rice millet-barley mixture was easily the most sustaining. Soya beans are tasty, but are very hard to digest, even without dysentery. They were frequently simmered all night in an effort to make them softer.

The bread in 1944 was inadequate in amount, but palatable. All too soon it became inedible. The contractor learnt the same trick as our fish contractor in Hong Kong. He delivered mildewed, decomposing bread which, if eaten, caused severe colic and diarrhœa. The Japanese were repeatedly shown this bread. In 1945 we built our own bakery—as in Hong Kong—and baked our own bread. This was palatable, but the ration amounted to only two thick slices per day.

Our cooks had always collected the bones from the meat market, and in 1945 they were careful to say that they were English or they got no marrow fat bones at all. When in 1945 the transport in Tokyo broke down, we had, as well, to fetch our vegetables from the vegetable market about twice a week. A small party of us wearing clogs and loin cloth, with or without shirt, would walk—with two Japanese as escort—the 1–1½ miles to the market. This was a very pretty sight. On a roofed-over space lay mounds of golden pumpkins, red tomatoes, the purple egg-plant (Aubergine) and sweet potatoes. We loaded some of them on to our handcart, and returned along roads which, after the great American fire-raids, were flanked by mile after mile of burnt rubble. Only a few concrete buildings remained standing. The inhabitants seemed apathetic rather than hostile.

We started extensive gardens just outside the camp in 1945. A hard, stony waste ground was broken up. It looked hopeless for gardening, but we underrated the power of night soil, in spite of Chinese experiences. The spinach and cabbage were grown in rows with small trenches on either side of each row. The night soil from the camp was put into the trenches—never dug in—and in the hot Tokyo summer quickly rotted down. The vegetables thrived! Every available piece of ground in the camp was also turned into garden. The smell of night soil permeated the whole camp.

It was most distressing that, after growing the vegetables, we were allowed no say in when they should be gathered or in what quantity. They would be brought into the store-house, left there for days deteriorating, and then we would get several meals with a glut of vegetables, after having had soup with none at all for some time previously.

The officers had large quantities of military yen, which were useless except to buy a few gramophone records. No food could be bought in Tokyo. I still have some thousands of these yen. Except for that from our gardens, the only extraneous food that ever came into the camp was a dog that walked in, and was stewing in the pot within half an hour.

Our cooking was done in kongs, but early in 1945 all fuel supplies stopped. We then had to obtain our own fuel. In the water surrounding the hospital floated many tree trunks. These had been thrown into the sea for safety

Some trunks broke loose and drifted past our island As soon as one was spotted some of us were sent swimming for it We pushed it alongside a pontoon that lay just outside a part of the hospital wall hauled it with infinite toil from the sea over an eight feet high sea wall into camp The trunks were then split up and axed by a special wood party Many hours were spent by the writer swimming for tree trunks in Tokyo Bay, and in sawing lumber

This concludes the briefest outline of this squalid camp which was hot and malodorous in summer and bitterly cold in the winter

All up-patients had to be lined up each morning and evening for roll call, which was in Japanese Everybody had to know how to number quickly In 1944 Lieutenant Davis reported to the Japanese N C O but in 1945 the doctors detailed as camp representatives—the writer was one for three months—took it in turns to report, we detailed the total number of P O W s the number of up-patients the number of bed-patients and patients in the guard house After this the Japanese N C O would go to each hut in turn and hear the up patients number in front of it and then go into each hut and hear each room number Lack of smartness or inaccuracy in numbering produced a scene of face slapping Neither mittens nor gloves were allowed Chilblains of ears and hands were extensive and very painful

The camps from which our patients came varied greatly in the degree of their inhumanity The patients were always emaciated and exhausted whatever their specific complaints were Many of the camps in Northern Japan were mining camps which were bitterly cold in the winter Neither food, clothing nor footwear were in any sense adequate for the climatic conditions

The patients came in batches following one of Captain Tokuda's visits to the camps in his district The patients were examined by us in front of Tokuda, and this performance was repeated from time to time until Tokuda ordered their discharge We had to suggest to him which patients were fit for discharge One felt very heartless in picking them out but room in Shinagawa had to be made for new arrivals Moreover improvement alone could be expected in the deficiency cases In 1944 patients were most loath to leave Shinagawa, but in 1945 when our conditions deteriorated rapidly, their attitude changed In the summer of 1944 staff and patients did not have to work very hard, but from the autumn of 1944 everybody had to work hard and for very long hours We arose at dawn and worked until late evening on the gardens, getting and axing wood emptying latrines making a big air-raid shelter for ourselves and many small ones for our blankets and other stores and making a small lake for our hand-worked pump Patients too ill to do this heavy toil worked at lighter duties in a little packing and sorting factory established at the back of the camp Work continued irrespective of rain It must be remembered that no patient had any change of clothing

The disturbed nights in 1945 aggravated our fatigue On hearing the siren we had to dress at once and go to the shelters These were originally trenches dug inside the camp We squatted in them in spite of the fact that they often contained much water The patients were frequently too weak to maintain

this squ[illegible] a face slapping ensued. After many representations we were [illegible] build the big air-raid shelter which was designed by Petterson. Work parties went into Tokyo to collect the wooden beams, which formed the skeleton for this shelter, from destroyed buildings. The whole framework was made on the mortice and tenon method with the use of hardly any nails. The shelter was, in fact, necessary. In the last of the great fire raids our tuberculosis hut was set alight but the fire was soon extinguished. The "Go Downs" just outside the hospital gate were on fire until the dawn, in spite of the herculean efforts of the whole camp, staff and patients. We feared the flames would spread into the camp.

It seems incredible in retrospect that the Japanese made us do physical exercises for 15 minutes daily after the morning roll call. All the medical staff took turns as instructors.

As for the purely medical work at Shinagawa, I feel hardly qualified to write because, although I saw patients on arrival and discharge, I was not in such intimate contact with all phases of their treatment as in Hong Kong. The following generalizations are fairly accurate.

The tubercular patients suffered greatly from their segregation and reduced rations. They were pitifully thin. Surgeon Lieutenant Dawson-Grove did everything humanly possible for them, including artificial pneumothorax work. Some cases were referred to me for phrenic crush under local anæsthesia. Tragically, in 1945 Captain Tokuda took over this hut. After that two Japanese N.C.O.s occupied the front bunk, and we were not allowed to enter the hut except by their permission. Tokuda experimented on the patients, whose morale naturally deteriorated. It is understood that Tokuda was subsequently executed for these and other crimes.

The adjoining hut for the most severe and acute general medical cases was under the care of Lieutenant Gottlieb, U.S.N., who worked whole-heartedly for his patients. In the next hut Captain Clayman, U.S.A., looked after the more chronic and convalescent medical cases. In these two huts were cases of beri-beri, chest diseases, cirrhosis of the liver, nephritis, infective jaundice, etc. The beri-beri was of a different sort to that seen in Hong Kong. We did not have the frequent glossitis, cheilosis, scrotal dermatitis, "electric feet" and pellagra which plagued us there. In Japan the disease appeared to affect particularly the posterior and lateral spinal columns. By contrast, pneumonia was common and our greatest worry. It was the classical lobar or multi-lobar form which we see relatively seldom in England today, and which never occurred in Argyle Street. Most cases responded to massive and prolonged doses of sulphonamides.

Œdema due to protein deficiency, with or without vitamin-B deficiency, was very prevalent. I believe that it was almost entirely a starvation œdema. My own spread all through 1945 from the toes, which it first affected, until it reached the lower part of the thighs. It would almost disappear with a suitable posture. I lay at night on boarding, supported on a trestle at one end and on a higher level window ledge at the other. As the fluid left one's legs painful cramps

occurred in the calves Massive doses of thiamin and nicotinic acid made no difference to this oedema

Liver damage from starvation was undoubtedly common We had five cases of cirrhosis proved at post mortem, and in some of them the liver had shrunk to an extraordinary extent In autopsies for other conditions the liver was large and yellow while the great omentum was a slender vascular membrane without a trace of fat in it

The next hut was always full of dysentery cases The stools were examined in the pathology room under the direction of Captain Keschner U S A Three negative reports were needed before our cases of amœbiasis could be submitted for discharge In 1945 all dysentery cases were sigmoidoscoped by me or Captain Tokuda prior to discharge Fresh stool specimens were then obtained and examined forthwith I must record that I have very seldom seen amœbic ulceration and never an amœboma Dysentery cases could seldom be said to be cured—relapse was so frequent Under the conditions of the dysentery hut reinfection must have occurred frequently The treatment was under the direction of Captain Warrack R A M C He found that sulphadiazine was more effective than sulphaguanidine for the bacillary dysenteries There was very little emetine and no E B I The chief drug for amœbiasis was carbasone, which was alone available in adequate quantities We were not impressed by it Many of these patients were suffering as much from their malnutrition as from their chronic relapsing dysentery

Our pathology department consisted of a small room adjacent to the operating theatre Captain Keschner U S A was in charge He had two microscopes and simple laboratory equipment Post mortems were done by him, while on a few of the most unusual cases Captain Tokuda arranged for a friend, the pathologist to Tokyo University to do the autopsy This Japanese appeared most deft and expert A list of the causes of death at Shinagawa is appended at the end of this report

The surgical work suffered likewise from Japanese interference From the end of August 1944, I was nominally responsible for the surgery but no case could be operated on without Tokuda's permission unless he was out of the camp, when his senior N C O gave the permission Tokuda may have been a "Jack of all trades" but it is certain that he was master of none Repeatedly he would operate on appendicitis cases pull much small intestine out, and fiddle about for a long time getting more and more angry and muttering in Japanese "Strange strange" He would then ask me to take over the case and would leave the theatre I never once saw him find the appendix As an example of his interference an Australian patient arrived and was diagnosed as appendicitis Clinically he appeared to have malaria and this was proved microscopically Tokuda insisted on doing an appendicectomy in spite of our advice to the contrary A normal appendix was removed Luckily the patient came to no harm

The theatre was small and contained a little electric sterilizer which was adequate for the set of instruments in use The instruments were American

Red Cross supplies and of a high standard. The table and light were good enough. Gowns, towels and gloves were steam-sterilized in an autoclave made by our carpenters. Water was boiled electrically in one container and the steam led into the base of an adjacent large tin containing the above items. The steam escaped by pressing up the lid of this autoclave around which was a wooden box packed tightly with sawdust. This produced articles which were sterile but most unpleasant to wear as they were hot and damp.

The temperature of the theatre was that of the climate, as no form of heat was ever obtained. In the winter of 1944/45 we had much snow. Patients were carried from hut to theatre on a stretcher and returned likewise, getting chilled on both journeys. The anæsthetics—with one exception for a case of severe burns—were all spinals, at the start procaine crystals dissolved in patient's C.S.F. and latterly pontocaine. Lieutenant Mohnac, U.S.A. D.C., gave these anæsthetics to perfection. I never once saw a severe post-anæsthetic chest, which is a great tribute to spinal anæsthesia under these icy conditions. Lieutenant Mohnac was an ideal colleague to whom I shall ever feel grateful.

The surgical cases were housed in the hut next to the dysenteries. Most were straightforward. Emaciation coupled with dysentery and heavy labour made herniæ and hæmorrhoids exceptionally common. The chronic leg ulceration that was such a feature in Hong Kong was never seen in Tokyo. The complication that worried the patients was intestinal cramps. These patients were very hungry on admission and, in spite of all advice, they could not resist eating their meals. So they ate their rice immediately after their appendicectomy or hæmorrhoidectomy or herniorrhaphy, etc. The cramps were severe but seldom caused vomiting.

A list of operations is appended at the end, so that only three special cases will be described here.

A sergeant in the Royal Scots had been in Shinagawa some time before my arrival. He had pyloric stenosis and was considered inoperable. He certainly was very emaciated, weighing only 46 kilograms (101 lb.). One of the camp cooks, who was exceptionally strong, volunteered to give blood for a transfusion. The patient was given a pint. Luckily it was decided to wait two days before the proposed operation. He had a severe reaction and developed ascites and generalized œdema. However, he gradually returned to his former state. He was then given a course of gastric lavage at night. Very little food was passing the pylorus. At last the great day came and he was explored. He had a healed duodenal ulcer that had almost closed the pylorus. A gastro-enterostomy was performed. It was made difficult by Captain Tokuda—who was assisting—constantly getting in the way. However, the patient did very well, put on some weight and was able to return to his mining camp two months later. He had been particularly unlucky, as he had had two severe attacks of amœbic dysentery while at Shinagawa.

The next case of note was a patient who had been producing large quantities of fœtid sputum for some time. He also was very ill. Surgeon Lieutenant Dawson-Grove localized the lung abscess in the right upper lobe and I resected parts of two ribs at the side of the chest and most luckily found the necrotic gangrenous area at once. A considerable amount of this was excised without producing any bleeding and a large tube was inserted. To my delight the patient did very well and was later discharged back to his camp. As I had had very little experience of lung surgery, apart from empyemata, this case was particularly gratifying.

The last patient of note was Dutch He was admitted with anasarca Captain Tokuda lanced his legs at the ankles to let out some of the oedematous fluid When the patient was first shown to me some time later he had obvious crepitant gas gangrene in both legs below the knees Extensive longitudinal incisions were made and the pus that poured out had an odour only to be described as similar to that of a neglected pigsty Large areas of skin sloughed but he survived, and when last seen in an American Hospital ship was making rapid progress

The only death on the surgical side following operation at Shinagawa occurred in a Dutch patient who was admitted with very extensive 2nd degree burns of the front of the chest, arms thighs head and neck The burnt areas were very dirty He was given a general anæsthetic and the areas cleansed and treated with a gentian violet jelly (Red Cross supplies) The patient was given several plasma transfusions and appeared to be doing well Unfortunately it was in the depths of the winter and after about five days he developed extensive pulmonary consolidation and died

Looking over this description of our work at Shinagawa I wonder if the picture has been painted too blackly, but I do not believe so The following incident will show the atmosphere in the camp.

In 1945 the Japanese refused to take the dead away for cremation This had been the practice The ashes were returned to the camp in a small wooden box which was labelled and put with the others in one of the rooms of the stores hut Suddenly we were ordered to cremate a body in the camp and were not allowed to do it outside Much argument ensued, but finally it had to be done. We did our best and it was not easy without apparatus It was known as "the Shinagawa Barbecue" As this depressed the patients so much Tokuda finally agreed to our building an apparatus close to the camp garden, and here all future cremations were performed by us

To look at the reverse side of the picture—what was the brightest memory of Shinagawa? Until early in 1945 all the P O W s' administrative work, detailing of working parties, ventilating camp grievances fighting the patient's battles keeping of records taking the roll call etc was done by Lieutenant J R Davis U S N C E C His worth was universally recognized, but it was not until he left us for Omori camp that the magnitude of his achievement and his complete selflessness were revealed to us After his departure his work had to be done by the medical and dental staff of the camp He will remain an abiding memory to all of us who worked with him at Shinagawa

As for regrets one naturally has personal regrets that one did not manage to do more for the patients We all regretted that we could not do more scientific work under these conditions We longed to be able to do blood chemistry and find out the levels of plasma proteins potassium and other ions, and so be able to differentiate between specific vitamin deficiencies and the results of simple starvation on such an unbalanced diet

Even without the aid of modern science and proper surgical instruments and medicines a great amount can be done by improvisation and it is a tribute to human endurance and the amazing resilience of the body that so many men, women and children survived even worse conditions elsewhere

APPENDIX I

Mortality Record from Early 1944 to August 1945

Beri beri	11
Pellagra	3
Malnutrition	6
Pneumonia	20
Tuberculosis	8
Nephritis	5
Perforated intestine	1
Intestinal obstruction	1
Cirrhosis of liver	5
Cancer of stomach	1
Amœbic dysentery	2
Cerebral thrombosis	2
Coronary athero-sclerosis	2
Cardiac failure	2
Brain tumour	1
Spinal column sarcoma	1
Septicæmia	1
Burns	1
Fractured spine	1
Embolism sequela bilateral fractures of the legs	1
	76

It was impossible to assign in many cases one actual cause of death as several factors were so often at work e.g. beri beri malnutrition and dysentery

APPENDIX II

Operations Performed from Mid-1944 to August 1945

Appendicectomies	14
Appendix abscess (one case treated by appendicectomy later)	3
Intestinal obstruction (one patient re-obstructed three months after his first operation He had three attacks of obstruction)	3
Ventral hernia	1
Herniorrhaphy	18
Herniorrhaphy and Hæmorrhoidectomy	1
Hæmorrhoidectomy	20
Anal fistula	1
Anal papillomata	1
Anal stricture	1
Pyloric stenosis sequela duodenal ulcer	1
Volvulus of cæcum	1
Talma-Morison operation	1
Drainage of abscess of lung	1
Phrenic nerve division	3
Empyema thoracis	2
Submucous resection	2
Circumcision	1
Hydrocele	2
Epididymectomy	1
Orchidectomy	1
Bilateral varicose veins	3
Abscesses	9
Gas gangrene of leg	1
Fractures	2
	94

THE CHRISTMAS ISLAND STORY

PART II

BY

Acting Surgeon Commander P D G PUGH, R N

PENRHYN

TOWARDS the end of April Squadron Leader Bradley departed for a week's leave in Honolulu One of the less onerous of his duties was to make an occasional visit to Penrhyn Island which lies about 600 miles south of Christmas Penrhyn was one of those places to which everyone was keen to go for no other reason than that it is inhabited by the true South Sea Islander both male and female! I therefore made it clear to the Commodore that I considered that a visit by a medical officer was desirable and suggested that it should be me a proposal to which he readily acquiesced

Penrhyn is one of the fifteen islands which together comprise the Cook Group These islands for the most part are small and widely scattered throughout an area of some 850 000 square miles of ocean extending from 8 degrees south to almost 23 degrees south and from 156 degrees west to 167 degrees west The total land area is approximately 88 square miles

The islands fall naturally into two distinct areas—a Southern and a Northern group Rarotonga the seat of the Administration is in the Southern group, Penrhyn is the largest (3 square miles) and the most northerly of the Northern group

Probably the first Europeans to visit Penrhyn were Mendana and Quiros, who passed through the Northern group in 1595 Captain Cook in 1773, during his second voyage of discovery visited several of the islands including Palmerston to which I will refer later There is however, no record that he ever visited Penrhyn The atoll gained its name following a visit from a British vessel, the *Lady Penrhyn* (Captain Sever) in 1788 There is however a modern tendency to revert to the old native name of *Tongarera* The natives say that Maui, a fabulous fisherman, landed two enormous sharks and then fished Tongareva out of the sea

In 1852 E H Lamont set out on a trading voyage through some of the islands of the South Pacific in a clipper brig of 300 tons burden the *Chatham* On the 6th January 1853 what looked like a dark cloud was sighted ahead, and mistaken by the Captain of the vessel for a storm Alarmed by the noise Lamont came on deck, and the first thing he saw was in his own words 'a black low coast stretching far on either side, girt by a circle of foaming breakers the roar of which was already in my ears It appears that it

was already too late to point this out to the Captain, for within a matter of seconds the vessel was on the reef The "dark cloud" turned out to be none other than Penrhyn, and almost immediately natives were observed advancing to the wreck with spears and clubs at the same time "uttering the most frightful yells accompanied by grimaces and contortions" It seems that apart from the Captain there was another unpleasant person aboard namely a Dr R Past antipathies seem, however to have been forgotten in the crisis for Lamont goes on to say "Dr R , who was *as brave as a lion*, looked as calm as I was excited I therefore proposed that we should make an attempt at landing under the doctor's command A successful landing was made, and before long we find Lamont describing the dress of the women as "consisting merely of a kind of short kilt called a *titche*, formed of a quantity of coco-nut leaves, slit into fine strips like grass and fastened to a cord at the top which secured it round the loins The mass of hay as it might be considered, drops down to near the knee, where it is cut square off and sloped up a little on the one side, *coquettishly showing the proportion of the leg more than would be considered strictly decorous* in discreet society" The shipwrecked mariners went on thoroughly to enjoy themselves for soon we find Lamont saying "All things considered why not take unto myself *another* wife? Having two already I need not scruple about a third, and so resolving, I raised my dark skinned beauty from her recumbent position, patted her on the head, and calling her my wife, said I would now really take her to Matunga, whereat in testimony of her delight she brought *her* nose into contact with *mine*, and treated me to an amount of friction which was more flattering than agreeable" The megaton age still finds these young ladies just as attractive *in form* as in Lamont's day but dressed in second hand, ill-fitting European female garments received in exchange for the "grass" skirts fashioned as of old, but *without* the "slope" Such is progress

Penrhyn is a perfect atoll the reef extending for about thirty-five miles in circuit with various islands dotted on it, the largest (Omoka) being about four miles long by a quarter broad Reefs between the islands can be forded, but about three passages to the deep central lagoon exist, one of which will take vessels as large as the New Zealand frigates *Rotoiti* and *Pukaki* In Lamont's day about fourteen of the islands were inhabited and in a constant state of feud with each other but alliances were made for mutual protection Although an attempt was made by the shipwrecked mariners to set up by themselves on one of the islands it never seems to have come to much, largely because of the quarrels between themselves Such in fact was the feeling that it appears that the majority repaired the wreck and escaped secretly leaving Lamont and a few others to their fate After many months in the island Lamont himself escaped in the *John Appleton* Whale Ship of New Bedford and eventually returned to the United Kingdom to write his memoirs in a book called "The Wild Life among the Pacific Islanders" published in 1867 a battered copy of which is preserved in Penrhyn

Penrhyn is also connected with an extraordinary gentleman called *William*

Marsters who in 1860 at the age of 21 suddenly announced that he was going to build himself a *paradise*—a place where he should be the law, where he should do as he pleased and live as he wanted to At dead of night he ran away from his home in Gloucester and later sailed in the barkentine *Mary Denham* bound for Sydney Fed up with the tedium of ship life, he deserted at Suvorov in the Cook Islands The precipitating factor was, of course that he had met a woman of about his own age and much lighter of colour than the other inhabitants of the island He called her Esther Following their marriage the couple went with her parents to Penrhyn. There a London Missionary Society minister she suggested that they should go to her own island, Penrhyn, where her father would help them settle down and give them land A few days later they sailed for Penrhyn but the local customs appalled Marsters He would not share his wife with the other men as was expected of him nor would he take other men s wives in exchange He decided to depart from Penrhyn so that he could have his wife to himself but back in Suvorov he discovered the same rule applied All women were joint wives, no man could keep an exclusive wife All the children born were community children, they belonged to every family and no man knew which he had sired The lone missionary had so far been unable to bring about a more stabilized form of life When Adeline Esther s sister began to show that she too, followed the custom that no woman could lay claim to the exclusive love of any one man Marsters did not appear to object Shortly after he sailed with the pair of them to the uninhabited atoll called *Palmerston Island* 500 miles to the south of Suvorov with the avowed intention of building for himself a paradise on earth Palmerston had been discovered in 1774 by Captain Cook

The three of them together built a house and planted seeds They lived for a time by fishing until the potatoes and other garden produce came along sufficiently well to maintain them It was not long before Esther was pregnant As neither woman knew anything about childbirth, and Marsters even less it was decided that he should go to the mainland and bring back Esther's niece Naomi, together with a cow some chickens, and a few coconuts This he did, and thus the first child was brought safely into the world It was however, apparent from subsequent events that Naomi, too, had decided that her children to be would be Marsters children

Marsters now got into his stride Using the Bible as his authority and in particular the Old Testament—in which men had more than one wife—as his guide he married Adeline and then Naomi When H M S *Wairpite* called at the island in 1871 Captain Delaware found that the Marsters nation had grown to 19 children the oldest of whom was young William then aged 9 years Everyone was reported to be in exceptionally good health with fine teeth The women and children all spoke English a strange Elizabethan English taught them by Marsters, native dialects being forbidden There were no favourites among the wives all being treated exactly alike The real paradise had been built From time to time adventurers from England who had heard of the island arrived with the intention of settling but all were unceremoniously flung out by Marsters

After eighteen years there were over 60 children. Now basing his entire theory and practice on the Old Testament Marsters performed marriages between his sons and daughters. There was only one thing he forbade, his sons could not marry their full sisters, the boys had to choose from among their half-sisters. Strict monogamy was enforced among the children, the endeavour to separate the strain proving extraordinarily successful. A careful account was kept in his Bible of his children, giving the dates of their births, the names of their mothers, their names and sex. Both twins and triplets are recorded and the sons and daughters were as prolific as himself. Although the island was only one square mile, it was worked with such efficiency that the earth was equally prolific and produced enough food to maintain the whole community.

By 1888 there was a total of 137 people made up of Marsters and his three wives, 86 children and 47 grandchildren. Not a single child was still-born or died in infancy. The first recorded death occurred in 1879 when a child of 2 years was drowned in the lagoon.

When the old man died in his sleep in 1899 he left behind a nation of 413 people. There has been no outside marriage whatever. His eldest son, also called William, ruled the atoll after his death. Following a hurricane in 1923 which almost wrecked the little island, half the inhabitants were moved to other islands. Towards the end of the 1930s the British Government appointed a commission to investigate and report on the intermarriage of the Marsters nation. They found both on Palmerston itself and on other islands that inter-marrying continued. Daughters married their uncle's sons and sons married their aunt's daughters, but all of them were from one common source, namely William Marsters. The commission reported that they could find nothing to indicate any detrimental effect caused by intermarriage among these people. Mentally they were alert and fully developed, and there was no trace of criminality or deformity, physical or mental; in fact every member of the families examined and questioned displayed the highest sense of decency, honesty, and forthrightness. The original Elizabethan language taught by Marsters is still spoken by his descendants and remains a source of surprise to those who visit the island.

In 1946, William Marsters, the first-born son, died at the age of 84, and was succeeded by his son Ned Marsters who rules Palmerston today as his grandfather did before him. Although the total population of the island is only 102 (1956), a census taken in 1946 traced some 5 500 people belonging to the Marsters nation and living in neighbouring islands who, despite the exclusion of new blood, suffered from none of those diseases or afflictions which medical science commonly attributes to interbreeding between blood relations. Palmerston was visited by H.M.N.Z.S. *Pukaki* returning to New Zealand on completion of Operation "Grapple."

In the year 1888 British sovereignty was assumed over the island of Penrhyn. On the 13th May, 1901, the British Government extended the boundaries of the Colony of New Zealand to include the Cook Islands, and on 11th June, 1901 the Cook Islands became part of New Zealand.

The inhabitants of Penrhyn are Polynesian and closely related to the New Zealand Maori There is a strong resemblance between the peoples in tradition language and custom All have been converted to Christianity There are two priests on the island, the one a Polynesian belonging to the London Missionary Society and the other a Dutchman to the Roman Catholic Mission The religious affiliations of the majority of the population belong to the London Missionary Society (*Congregational*) Only two of the islands comprising the atoll are inhabited today *Omoka* the main island where trading schooners may tie up at the wharf and *Tetautua* nine miles away, across the lagoon Both settlements are kept clean, and each has two good 5,000 gallon water tanks In Omoka, the water is led by pipes from the tanks into the settlement Both have fine congregational churches almost identical in construction The church plays a most important part in the life of the community Until the Cook Islands Act 1915 laid down the basis of the private as well as the public law of the territory, the church ruled the roost alone The pioneer missionaries not only very quickly converted the natives to Christianity, but also obtained control over the native chiefs and virtually directed the Government

Beatrice Grimshaw wrote in 1906 "The Protestant Missionaries, with the best intentions in the world carried things decidedly too far in the way of grandmotherly laws Even white men were forbidden to be out of doors after eight o'clock at night on pain of a heavy fine and the offences for which the natives were fined would be incredible were they not recorded in official reports "

In those days and up to as recently as twenty-five years ago a native who walked at dusk along the road with his sweetheart was obliged to carry a burning torch in his hand, and he was fined if he let it go out The '*Blue Laws*' as they were known are not yet entirely gone—they have been only modified—but as constitutional government was introduced the tight grip which the missionary government had over the natives was relaxed Of missionary rules still enforced today one may cite that there is for instance a curfew at nine o clock at which time a loud gong is struck an exception being made on dance nights Cycling is not allowed on Sundays, and shirts must be worn on that day

The island surface is largely composed of coral sand and rubble Coconut palms thrive but the range of other food crops is small Fish are plentiful, inside the lagoon a wide variety of edible small fish may be netted yet the natives prefer to live out of tins This is a result of increased monetary returns from pearl shell during recent years, and both general and dental health have suffered Pearl shell provides the most important industry diving operations taking place in the deep water in the lagoon The shell is sold to a New Zealand trading firm or bartered for cloth etc with an American firm which has recently started trading with the islands

The Cook Islands are singularly free from true tropical diseases, the only significant ones being yaws, filariasis, and helminthiasis, and leprosy *tuberculosis* is the greatest single fatal disease A mass miniature radiography

unit has now commenced operations, and BCG vaccination is being carried out in conjunction with this survey on all Mantoux-negative individuals. Posters are widely displayed, including an interesting one illustrating the value of the coconut as a combustible sputum flask!

All Maori patients receive free medical and surgical treatment. Penrhyn has a resident Polynesian doctor and a small hospital (six beds). All serious cases are evacuated to Rarotonga where there is a general hospital with a maximum of fifty-seven beds, including a five-bed maternity unit, with dispensary and limited X ray and laboratory facilities. There is also a Sanatorium with a maximum capacity of sixty seven.

In connexion with the operation a small tented Air Force detachment had been set up on the main island at Penrhyn which was responsible for the maintenance of the airfield and weather station. There was a small M I room staffed by a R A F medical orderly. There was also a Decca station, staffed by civilians, which provided navigational aid for weather ships in the vicinity. Alongside the R A F camp was an American camp set up in connexion with the Geophysical Year. The Americans mixed freely with our men, and appeared on the best of terms.

The Resident Agent, a Polynesian, David Metuarau, lived in a fine house overlooking the lagoon. A liaison officer for Operation "Grapple" by name Mr Donald Read shared the residency with the Resident Agent. It is largely to Mr Read that the happy atmosphere and the enjoyable time experienced by all who visited the island can be attributed.

As a result of a mishap to the aircraft in which I landed at Penrhyn it became clear that I was there for the night instead of the two hours originally planned. Mr Read kindly offered to put me up, and subsequently extended to me, as he has to so many others, the most generous hospitality.

It is possible to walk round the main island of Penrhyn in a matter of a quarter of an hour possible that is if you resist the almost irresistible invitations of its inhabitants to come inside their houses and inspect their grass skirts and pearls. They are a most charming and happy people, the girls always smiling and attractive, the men polite and courteous. Their houses are most beautifully kept, although they contain enormous quantities of people. At least three generations appear to live in each tiny house. The most striking thing to me was the way in which the wife ruled the roost. They seem to have progressed farther along this path than even English ladies. Every bartering transaction had to be submitted for approval, and was almost invariably turned down, and a more profitable bargain sought. This at times seemed to drive the husband as well as me into a state of frenzy. Time was no object to these people and hence bargains were difficult to strike. On the other hand they are such kindly people that they would think nothing of giving away something for which a few days previously they had refused a reasonable offer. This applied in particular to pearls, for which they might ask ridiculous prices and yet a few days later give away

My evening at Penrhyn was particularly enjoyable. After dinner, my host invited me to sit out in the verandah overlooking the lagoon and throughout the evening a succession of guests dropped in for the odd noggin and a chat.

It was only a couple of steps from the verandah to the edge of the lagoon, and as I had to sleep without a net, the mosquitoes did not find it a difficult job to make life so unpleasant for me that I took the unusual course of leaping out of bed at half past five in the morning and plunging into the lagoon. And very delightful it was. Soon after dawn H M N Z S *Rotoiti* arrived off the atoll.

The day was the 25th May—Anzac Day, and Mr Read was anxious to make as big a show of it as possible for the natives who had never before seen the ceremony. But none of these things were for me, for no sooner had *Rotoiti* dropped her hook close to the Residency than the relief Shackleton that had first arrived an hour or so previously was ready to depart.

The First Drop

And now the time was drawing nigh for the first 'drop'. All the rehearsals except the final one had been completed. On the 7th May *Warrior* sailed for Malden. At later dates H M N Z Ships *Rotoiti* and *Pukaki* which were acting as weather ships took up their respective positions and H M Ships *Alert Cook* and *Messina* sailed for the forward area. H M S *Narvik* was already in the vicinity of Malden. On 11th May the final rehearsal took place.

There was much speculation as to whether we would have any unwelcome visitors. We had read in the *Mid Pacific News* towards the end of March, and subsequently in the London dailies, that a London couple Mr and Mrs David Steel had stated that they were determined to get into the danger area aboard the threatened Japanese suicide fleet. Mr Steel told reporters that he hoped they would not be killed but that they would be injured or receive radiation burns to show the world how horrible nuclear war was. *The Times* of 3rd May stated "Much attention has been attracted by two young British pacifists Mr David Graham, aged 25, and Mr Ian Dixon, 21, now widely known as 'the British Satyagrahis' who have appealed in Delhi for funds to enable them to go to the Christmas Island area and stir the conscience of their countrymen by exposing their bodies to the deadly effects of nuclear radiation. The Japanese authorities have offered them visas only on condition that they do not expose themselves to any such danger. They now propose to travel by way of Fiji."

14th May was D—1, and throughout that day scientists and members of the three Services were withdrawn from Malden Island and embarked in *Warrior* (*forward control ship*), *Narvik* (*scientific base ship*), and *Messina*. During the evening V I P s arrived by air from "Christmas" and were taken aboard *Alert* (*observer frigate*). Amongst them were representatives from Australia, Canada, New Zealand and the United States.

Meanwhile at Christmas Island, the preparations had been going ahead. The ground crew of the Valiant 81 S together with the scientific teams had begun the comprehensive preparations for bombing-up. Shackletons and Canberras

had taken off on weather reconnaissance, with the added duty for the Shackletons of searching to ensure that the danger areas were free from shipping The Gilbertese villagers had been evacuated to Fanning Island aboard the R F A *Fort Rosalie*

At 0500 on the 15th May the Task Force Commander confirmed that the situation was favourable for D-Day, before taking off for Malden where he was to make a final decision from H M S *Narvik*

Meanwhile the ships moved to their appointed positions At 1000 aboard *Warrior* the hands were piped to divisions on the flight deck and subsequently inspected to ensure that they were properly dressed The rig consisted of

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No 8's antiflash hood and face mask anti glare goggles anti flash gloves and film badge Officers wore the same rig excepting that a white combination overall suit and shoulder straps was substituted for the No 8's Following their inspection the hands were dispersed to stations for witnessing the burst By now the vapour trail of the Valiant could be seen and behind it that of a second Valiant, acting as a 'grandstand' Piloted by Wing Commander K G Hubbard, *O B E*, *D F C*, the leading Valiant passed overhead on her

initial run over the target. Two such dummy runs were undertaken, and as she wheeled round for the third time we knew that all being well, this was it. As she passed overhead I noticed that not more than about one-third of the ship's company looked up, there was a feeling of tenseness amongst us all—a feeling of entering the unknown which is hard to describe—perhaps a feeling of *"I hope to hell she doesn't drop the thing now."* Already we were seated on the flight deck with our backs to the target, our goggles on, our eyes closed and our hands over our goggles. From the bridge a midshipman who rivalled John Snagge of the B B C in his ability to describe the occasion, told us first the number of minutes and later the number of seconds prior to the expected release of the weapon. Subsequently after the message "*Bomb gone*" had been received a count down was given to the expected time of the burst. "Five, four, three, two, one, NOW," cried the commentator, and at that very moment

Fig. 6.

we felt a momentary wave of warmth on the nape of the neck, yet saw nothing. The deadly silence previously prevailing on the flight deck was broken for a second or two by low murmurings, but silence again ensued as the count up approached the point at which we could look round. "*Nine, ten. Remove*

your goggles Turn round and look at the BURST" said the commentator The last few words were almost shrieked The time was 1039 As my goggles came off and I opened my eyes the heavens were momentarily so brilliant with the dying flash that I wondered whether or not it was yet safe to turn round The effect was, however undoubtedly accentuated by virtue of the fact that our eyes had been closed for a minute or so before On turning round the fire ball, by this stage about as bright as the sun, could still be seen, situated high above the sea and rising rapidly Our eyes were now turned to the left where we were gratified to see the vapour trails of the two Valiants, safe and sound fleeing from the scene of this gigantic explosion

By courtesy of Surgeon Lieutenant R. H. David on

FIG 7—*The Bomb and I*—15th May 1957

And now the fire ball was being rapidly replaced by the familiar mushroom whose stalk grew as the cloud soared upwards About this time too the sound of the explosion like that of distant gunfire reached our ears Within the heart of the mushroom there was now to be seen a peach coloured glow as of a furnace buried within This was caused mainly by the release of peroxides of nitrogen and was also partly due to the fact that the cloud is really like a dough-

nut (the circular variety), and thus less dense in the middle than at the periphery This became more apparent later on when as it penetrated the tropopause the cloud flattened off into a round disc and subsequently formed a halo, occupying a large proportion of the sky still present at sunset, whilst long since the stem had leaned over drunkenly and disappeared To hark back for a moment to the initial scene as the stem of the mushroom grew we saw an inverted cone of cumulus cloud forming beneath it (due to condensation following the inrush of air into the vacuum created by the explosion), and below this a disturbance on the surface due to dust being blown about (*not sucked up*—as it was a high air burst) on Malden As the whole coalesced, it gave the appearance of an overflowing giant ice-cream cornet of pre-war vintage Meanwhile above the mushroom appeared a series of '*snow caps*' a term which I feel is self explanatory of a phenomenon believed to be due to shock waves

After the bomb and in particular when it became apparent that initial investigations showed that the test had gone off according to plan, the feeling of tension eased Although a few were frankly disappointed in what they had seen, the majority considered it an unforgettable spectacle Most of those who were disappointed began to realize what a tremendous weapon this is when they calculate roughly the size of the cloud must have been Seen from many miles the dimensions of such a cloud can be very deceptive

I have been asked how this spectacle compared with that at Monte Bello when our first atomic bomb was detonated At Malden it was the *warmth* on the back of our necks rather than the flash that told us that the explosion had taken place, but at Monte Bello we did not wear anti-flash goggles This explosion was far more *colourful* we saw the fire-ball, and the orange glow already described, the former had already died by the time we looked round at Monte Bello and the latter was never apparent The *shape of the cloud* was rapidly distorted at the first test because of the prevailing wind here we witnessed the perfect mushroom in all its glory As regards *size* it is difficult to hazard a guess because the clouds were seen from different distances, but this was clearly several times larger The "*bang*" here was less intense—almost disappointing—but this was a high air burst seen from a considerably greater distance It is, however, of interest to note that the "bang" was clearly heard at Christmas Island—400 miles away at 1117

Throughout D-Day and D+1 the work of collecting samples went ahead During this phase our Ship's Flight played a most important part, making numerous trips to Malden—where scientists examined the installations and collected records Fish were caught and submitted to careful examination not only on this but on succeeding days and from over vast areas (including a 12 foot long 980 pound black merlin off Christmas'), proving beyond any shadow of doubt that our scientists were correct in forecasting that no contamination to them would occur

For obvious reasons I have had little to say about the scientists and the scientific side of the operation We saw experienced and felt exactly what they foretold and to them must go much credit W R J Cook, *C B., M Sc*, the

Scientific Director, has been connected with the Services since the early days of the last war. From September 1946 until September 1954 he worked at the Admiralty, first as Director of Physical Research and later as Chief of the Royal Naval Scientific Service. In September 1954 he joined Sir William Penny to work on the H-bomb.

Our task completed, we sailed for 'Christmas' on the evening of 16th May. It proved an eventful voyage. Early on the 18th, whilst still some distance from 'Christmas' a light was seen flashing in the distance. The message proved difficult to read but it soon became clear that it said "*Stop Hydrogen Bomb Tests. Go Home Warrior*." Immediately a flash signal was sent to the Task Force Commander "*Have received following signal from unidentified vessel, etc. Am closing her. Request further instructions.*" Shortly after a further signal came from the vessel—"*Go home sailor*"—and at the same time through the darkness the dim outline of a boat could be discerned, flying a large Japanese flag and with long poles hanging out over the side (as is the custom in Japanese fishing boats). There could now be little doubt and we closed at speed. Then two things happened. First the following signal was received from 'Christmas'—"*Investigate vessel forthwith, but do not go home*." Secondly, it became apparent that the vessel was none other than a motor cutter from ashore manned by a crew from the Port Camp. We were had 'hook, line and sinker'. To make matters doubly worse, as the cutter approached us we were hailed "*Have mail from Tokyo for you*." Being slightly ashamed however, we pushed on. As a result, on our arrival at "Christmas," the L.C.M.'s brought out potatoes and lettuces but no mail, and we had to wait till noon before the "fishing boat" returned. There seems little doubt that our Commodore, who had flown to "Christmas" the day we left Malden, had had a hand in this affair.

The few days' break at 'Christmas' were much appreciated. At the same time preparations went ahead for the next 'drop'. At this time, too, we said farewell to H.M.S. *Cook*, which sailed for Fiji to commence her survey work.

The Qaloqalovi and Yaqona Ceremonies

We sailed again for Malden and the second 'drop' on 26th May. Shortly after our arrival on the 27th we were joined by Lt. Col. P. K. Ganilau, *D.S.O.*, and Commander S. P. Brown who had flown up from Fiji. The former is the ex-Commanding Officer of the Fijian Infantry Regiment, and in addition, a Paramount Chief of Fiji, and of Royal blood. Commander Brown is the Commanding Officer of the Fijian Royal Naval Volunteer Reserve, and is held in the highest esteem by our Fijian ratings. A Fijian Seamen's Guard was paraded and inspected by the Colonel.

During the evening, ceremonies took place which I was privileged to attend, and which I feel are worthy of recording in some detail. It will be recalled that when Her Majesty visited Fiji a few years ago she was presented with a *Tabua* (Whale's Tooth) by a Paramount Chief before going ashore from the *Gothic*. This presentation, the *Qaloqalovi ceremony*, is the highest honour which a Fijian can bestow on a distinguished personage. To commemorate the

occasion our Fijian ratings arranged to present such a tooth to their Chief As our Commodore was also regarded as a Chief in so far as he represents Her Majesty, he could not be invited to attend lest embarrassment be caused to either side Hence invitations were extended only to the heads of those departments in which the ratings served

After dinner, led by the Colonel we made our way to the Fijians mess where we found them solemnly squatting at the forward end of the space facing a row of chairs which had been provided for us The Chief took his seat in the centre chair, and on his right sat the Commander A young Fijian stepped forward and squatted just in front and to the right of his Chief He was the *Mata Ni Venua* (Eye of the Hand), the personal servant and spokesman for the Chief The entire ceremony was conducted in Fijian First the senior Petty Officer arose and gave a short speech of welcome to his Chief at the same time handing him the whale s tooth to which was attached a small ornamental straw garland The purpose of this garland is not to attach the token around the neck, as might be expected but is ceremonial and connected with the manner in which the gift is laid upon the hand and forearm of the recipient The donor apologized profusely for the size of the tooth and said it was a very small one The speech follows a rigidly formal pattern and is practically the same whenever the ceremony is performed The Chief accepted the gift and thanked the Fijians for their kindness and loyalty in remembering their Chiefs He promised to convey any messages for them to their families in Fiji He then handed the tooth to the Mata Ni Venua, who made a formal acceptance on behalf of the Chief and added that in fact it was a very large tooth

Now began the *Yaqona (Kava) Ceremony* Yaqona is the national beverage of Fiji It is made from the roots of the Yaqona tree The Fijians aboard used to go through a similar but rather more informal ceremony each night, when they consumed this refreshment in lieu of a tot The substance is said to have medicinal properties (genito-urinary antiseptic) If consumed in excess one s urine turns green and one feels "weak on one s pins," but I understand it has no alcoholic content containing only resin starch and methysticin I will relieve the reader s anxieties at once by recording that no untoward symptoms were reported to me later on by any of the guests I am told that in Fiji in the absence of geriatric wards the elderly consume Yaqona and hope for the best For the prostate, it is probably excellent treatment

The mixing of the drink is a complicated process In Fiji an entire tree is uprooted and presented to the Chief whilst the drink itself is mixed from powdered root previously prepared Here the first part of the ceremony was omitted for obvious reasons Behind a large bowl squatted F S B A Kete almost paralysed with the thought of the huge responsibility that lay ahead, for he was none other than the chief mixer (*lose*) of the Yaqona. On his right sat the "water adder" (*dauluinai*) armed with a large bottle of water In Fiji a hollow bamboo cane is used for this purpose On his left sat a third rating delegated to see fair play These three are collectively known as the *Qaraiyaqona* Behind these sat the rest of the company watching the proceedings in deadly silence First the powdered root was placed in the bottom of the bowl,

then water was added Meanwhile the Mata Ni Vanua directed, on behalf of the Chief, when more water should be added and how much stirring should be done Then the mixture was strained with shredded hibiscus bark until such time as the Chief signified through his spokesman that it was ready for consumption A tassel previously stretched out straight in front of the bowl was now curled up to signify the conclusion of this stage The first bowl of Yaqona is given to the recipient of the Tabua Thus the Chief was now handed a coconut bowl (*bilo*), and this was filled with the liquor The assembled audience now clapped three times and the Chief drank the lot in one The senior Petty Officer now cried "*A Maca*" which mean "whacko" or "He's drunk the lot" Following this everyone clapped again three times The Mata Ni Vanua is always the next person to receive the cup this is known as the *rabeti na yaqona* Even when Her Majesty visited Fiji, I understand, it was this man's turn before that of Prince Philip Three more members of the Chief's party now received Yaqona in each case followed by a cup being passed to a Mat Ni Vanua appointed to the particular person and who sat in the crowd This ended the formal part of the ceremony After that we all had a go each following a rather less rigid ritual I cannot say that the taste was at all agreeable but it is probably something that grows on you, like beer, however we all managed to keep it down and maintain our dignity

Then the Chief made a special speech (*vosavakaturaga*), in which he spoke earnestly and forcibly to his people He told them that before he left Fiji he had been sent for both by the Governor, the District Commissioner and the Fijian Affairs Board and that they had asked him to offer special congratulations for the hard work they had been told had been undertaken by the Fijians aboard *Warrior* Then he told them what a unique experience it was for them to serve under the British who were the greatest fighters in the world, and asked them to carry on as they had already done pointing out that just one man causing trouble could bring dishonour on them all Then getting up he addressed the visitors in English Explaining that the presentation of the whale's tooth was the highest honour that a Fijian could bestow he added that it could have even greater significance Pointing to the Petty Officer he said amid laughter "If I offered this tooth to the Petty Officer and told him to kill the Commander and he accepted the tooth, you" he continued, pointing to the Commander, "would be as good as gone" In bygone days acceptance of the tooth meant that you were prepared to carry out a wish One could either accept the tooth and carry out the wish, return it to the donor, or hand it to someone else who, if he accepted it, would have to carry out the wish We were told later that the last murder by this method took place in Fiji over seventy years ago

After the Chief had concluded, the senior Fijian rating got up and expressed thanks, and in this way the ceremony ended It had been a most interesting evening sharing and experiencing the ancient customs of these most loyal, cheerful and hard-working people

(*To be continued*)

NELSON AND THE SURGEONS

BY

Miss J. DOBSON

The Court of Examiners of the Royal College of Surgeons of England has an interesting history. It was in 1540 during the reign of Henry VIII that the Barbers and the Surgeons of London were united by Act of Parliament to form the Company of Barber Surgeons. Fifteen years later, regulations were drawn up providing for the appointment of thirteen examiners, including the Master of the Company, to approve the ability of those persons desiring the Company's licence to practise. In 1629 these regulations were made more explicit by a Charter granted by Charles I which stated that no one was to practise surgery in London or within seven miles of it except members of the College of Physicians, unless examined and approved by the Examiners of the Company, and every person so approved might practise surgery anywhere in England. The Court of Examiners then established consisted of ten Freemen of the Company and they also had the duty of examining surgeons and surgeons' assistants for the Royal Navy and Merchant Service and of inspecting their instruments and medicine chests. Naval surgeons paid no fee but were requested to make a contribution to the poor box if their means permitted. The Court, in effect, controlled the policy of the Company and the office of Examiner, therefore, was a most honourable and lucrative one.

After separation from the Barbers in 1745 the Surgeons built their headquarters to the east of the Old Bailey, the first meeting being held in the new Hall on 1st August, 1751. In 1758 the Company was desired by the Commissioners for Sick and Hurt Seamen to examine naval personnel for purposes of superannuation or compensation for wounds, to estimate the degree of disability and approve the amount of expenses incurred in treatment. The numbers of such visitors to Surgeon's Hall varied considerably over the years, depending for the most part on the degree of intensity of international feeling. Up to the year 1794, most of the cases dealt with were applications for superannuation, but with the outbreak of hostilities against the French a constant stream of wounded heroes presented themselves for examination. So many were there, in fact, that the Court of Examiners, who performed this function, on occasion met every two weeks instead of every month as was the custom. It was just at this period that the condition of the building near the Old Bailey was causing anxiety and the Company therefore decided to seek new accommodation. This they found in Lincoln's Inn Fields where number 41 on the south side was purchased in October 1796. The first building on this site, built about 1642, became known as Cardigan House owing to the fact that it served as the town residence of two Earls of Cardigan. The premises purchased by the Company, however, had

been erected about seventy years previously and from 1758 until 1768 this was the home of the Earl of Northington, then Lord Chancellor

The first meetings of the Company were held in this house on 5th January 1797 and it was here that 'Rear-Admiral Sir Horatio Nelson K B' was examined by the members of the Court of Examiners on his first visit on 12th October 1797 (fig 1) His intention was to gain the opinion of the Surgeons about the injury to his eye sustained three years previously on 12th July, 1794 at the seige of Calvi in Corsica

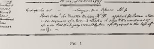


FIG 1

The events leading up to this incident were complex For some years the state of affairs in France had been a source of disquiet to other monarchies who, for a time, remained neutral but watchful After the execution of Louis XVI on 21st January, 1793 the revolutionaries cried defiance to all their neighbours The King's death stirred popular opinion in England to its depths and furthermore the threatened annexation of Belgium was a possible danger The National Convention now the ruling body in France, made the first step however and declared war against Great Britain on February 8th Other European countries quickly joined this country to form a coalition against the republic and so it happened that in June 1794 Nelson sailed in the *Agamemnon* to the Mediterranean station In the following month at Calvi an enemy shot struck a battery beside him throwing up splinters and stones which bruised and cut his face, especially round the right eye

The certificate issued by the doctors attending him at Calvi states that 'Horatio Nelson, Esquire Commander of His Majesty's ship *Agamemnon* did receive a wound of the iris of the right eye which has occasioned an unnatural dilatation of the pupil and a material defect of sight ' The document is signed by John Harness then Physician to the Fleet, and by Michael Jefferson who designates himself as 'Surgeon attending on shore ' In actual fact Jefferson was only qualified to serve as second mate, second rate having been approved as such at Surgeon's Hall on 14th April 1793 Nelson was able to perform some of his duties even on the day of his injury and on the next day was at his post as usual but by the time that he presented himself before the Court of Examiners on 12th October, 1797, he had completely lost the sight of this eye James Kemble, in his

delightful book "Idols and Invalids," published in 1933, gives his opinion that 'the concussive violence of the blow upon the side of the head and face produced detachment of the retina' If the eyeball had been damaged severely enough to cause immediate loss of sight it would have incapacitated him for longer than a few hours, as well as leaving some visible sign Nelson himself says however in a letter to his wife that the blemish is nothing not to be perceived, unless told '

During the three years that elapsed between the injury to his eye and his first visit to the Company of Surgeons Nelson did not return to this country, and during that time he was wounded twice more At the Battle of Cape St Vincent, on 14th February, 1797 he was struck on the left side of the abdomen a wound of moderate severity the consequence of which he felt for the rest of his life The second injury was sustained during the attack on Teneriffe on the night of 24–25th July of the same year

The coalition against France soon lost its cohesion partly because of the amazing successes of the French troops and several of the members including Spain deemed it politic to make separate treaties with the enemy The victory over the Spanish fleet off Cape St Vincent was therefore a very heartening event and when soon afterwards it was rumoured that a Spanish treasure ship had put into the harbour of Santa Cruz it was decided to put the success to practical use and make an attempt to seize this prize A small squadron, consisting of four ships of the line three frigates and a cutter with Nelson in command set sail on 15th July for Teneriffe

But the expedition was unsuccessful British casualties in killed wounded and drowned, amounted to two hundred and fifty Nelson himself was one of the first to fall for as he stepped on shore at the head of the attacking force he received a musket-shot through the right elbow This might have proved fatal had not his stepson Lieutenant Josiah Nisbet had the presence of mind to tie a handkerchief round the arm above the lacerated vessels The *Seahorse* in command of Captain Thomas Francis Fremantle was the nearest vessel but Nelson insisted on being taken to his flagship *Theseus* lest Mrs Fremantle should be alarmed by his appearance Back on board amputation by the circular method, through the middle third of the arm was at once performed There were no anaesthetics and the operation consisted of a few speedy cuts with the amputating knife, tying of the vessels and stitching up

In the *Theseus* were two surgeons Thomas Eshelby and Louis Remonier The latter was a French Royalist refugee then aged 24, who had been a surgeon at Toulon Hospital and had been granted permission to serve in the Royal Navy where his rank was that of surgeon's mate The other mate George Henderson, of Alloa in Scotland was killed during the assault Many of Nelson's biographers have assumed that Remonier performed the amputation though the reason for this is not very clear The Admiralty records show that Eshelby was the ship's surgeon and as such would undertake the operation and one of Nelson's letters to Lord Keith mentions Remonier as *assisting* at the amputation

Thomas Eshelby was born at Thirsk in Yorkshire on 27th February 1769

He qualified as third mate third rate, at Surgeon's Hall on 7th April 1791 and as surgeon, fourth rate, on 4th September 1794 He joined the *Theseus* for the expedition to Teneriffe on 27th May 1797, being then 28 years old and having had several years experience of naval surgery

Although several writers have deduced from the circumstantial evidence that Eshelby actually did the operation no absolute proof seems to have been available for even Eshelby's own entries in the ship's Journal merely state that the amputation was performed and the usual after-care provided, without mentioning any names Recently, however among the manuscripts at the National Maritime Museum there has been found the list of expenses submitted by Nelson to the Court of Examiners of the Company of Surgeons for their approval The details of these have not previously been published in full and the document contains much other interesting information

The first item refers to Remonier who received twenty-four guineas "for assisting in amputating my arm and for attendance from the 25th July, 1797, to the 17th August following during which time he sat up 14 nights" The second reads 'Paid Thomas Eshelby for amputating my arm, quitting the *Theseus* and attending me to England in the *Sea Horse* frigate from the 25th July to 3rd September £36" It was apparently considered wise for Eshelby himself to accompany his patient home though it is stated that Nelson would not allow his arm to be touched during the voyage which lasted twelve days David Fleming who had qualified as a surgeon on 6th May 1794 had previously been in the *Sea Horse* but was transferred when Eshelby came on board for this was the only ship of the squadron returning to England Captain Fremantle also had been severely wounded and his wife assisted Eshelby in nursing the two distinguished invalids, both of whom were convalescent on their arrival at Spithead on 1st September

These first two items on the list of expenses are of particular interest for they give evidence of the fact that medical men in the Services were permitted to make special charges for duties additional to those normally required of them The basic pay of the naval surgeon at this period was £5 a month together with 2d per head per month for each member of the crew so that these extra fees must have been a very welcome supplement to their income

Nelson at once went to Bath where his father and his wife were then staying The third item on the list of expenses related to a Mr Nicholls there who was paid £12 'for dressing my arm and attendance from the 3rd to 18th September ' This was probably Morgan Nichols, surgeon to Bath General Hospital sometime Alderman of that town and Mayor of Bristol in 1815 Two pounds was paid to Mr Spry for medicines, and a guinea to 'Dr Faulkner for advice ' This was almost certainly William Falconer, Physician to Bath General Hospital a Fellow of the Royal Society and eminent not only as a physician but also as a writer and scholar

But apparently Nelson was not entirely satisfied with the treatment he was receiving in Bath and after a fortnight decided to go to London for further advice He took lodgings at 141 Bond Street and here, for thirty days, he was

attended by "Mr Cruikshanks" who received a guinea a day. This was William Cumberland Cruikshank, the anatomist who had been William Hunter's partner at the Windmill Street School from 1774 until 1783 and who was the author of the first English authoritative work on the lymphatics. At the time of his attendance on Nelson, Cruikshank was 51 years of age. His death three years later was thought to have been occasioned by an over-indulgence in alcohol.

It was three weeks after his arrival in London that Nelson presented himself to the Court of Examiners at 41 Lincoln's Inn Fields. John Gunning was at this time Master of the Company and the others present were Charles Hawkins, Isaac Minors, Samuel Howard, William Lucas, James Earle and Joseph Warner who had made a special study of the eye and its diseases. This was a private Court held at an earlier hour than was usual, possibly because Nelson was still far from being in good health. The decision of the Court was that "the injury received by him is fully equal to the loss of an Eye." No claim for expenses seems to have been made on this occasion, nor was the injury to his arm mentioned. On this, his first visit to the Company of Surgeons, Nelson was apparently unaware that the applicants for examination had to pay a fee of a guinea, for he came without any money at all and was obliged to borrow it from the Secretary, Mr Okey Belfour. This was repaid shortly afterwards, accompanied by a handsome china tea service.

No date is given on the list of expenses for what appears to have been a special consultation of three surgical experts to give their opinion about the continued pain in the amputation stump, but possibly this took place after Nelson's first visit to the Court, for James Earle was one of the three. He was the son-in-law of Percivall Pott, Surgeon-Extraordinary to the King and was for thirty-one years surgeon at St Bartholomew's Hospital. The other two were Thomas Keate, Surgeon to the Prince of Wales and John Hunter's successor as Surgeon-General to the Army, and John Rush, Inspector-General of Hospitals. Keate and Earle were both Members of the Court of Assistants and later served as Masters of the Company. All three received a guinea for the consultation, and it was possibly at this time that it was suggested that either the median or ulnar nerve had accidentally been caught up in the ligature at the time of amputation, this being the cause of the prolonged discomfort. Soon after Nelson's death, Lady Hamilton commissioned a rather obscure writer named Harrison to write a biography and it is in this that a statement occurs that some mistake was made "in taking up one of the arteries, which is described as having been united with a nerve, by an ingenious French Surgeon." Robert Southey in the "Life of Nelson," further remarks that "the ligature, according to the practice of the French surgeons, was of silk, instead of waxed thread," and it is probably from these sources that the idea arose that Remonier was the amputator. Kemble suggests that the inclusion of a nerve in the ligature would not necessarily have occasioned pain which was probably accounted for by the continued presence of sepsis.

The last complete item on the account of expenses is of a payment of twenty-

three guineas to Michael Jefferson "for attendance from the 19th October to the 13th December 1797" Jefferson therefore assumed the care of the wound when Cruikshank's "30 days' attendance" was completed, and it was on this very date that he gained his qualification as a naval surgeon from the Company of Surgeons Nelson must have thought highly of this young man at this time for after he was pronounced fit for service in the middle of December and was able to dispense with a personal medical attendant he arranged that Jefferson should be appointed to his ship the *Vanguard* which set sail the following spring for the Mediterranean It was Jefferson who tended Nelson when he was wounded during the battle of the Nile in August of that year but after that he seems to have fallen from favour Through Nelson's influence he was appointed to the Malta hospital but intemperance lost him this post and nothing more is known of him

The last item on the account, for Sick Quarters, is left incomplete no amount being entered in the column of expenses Apart from this the total claimed was £135 1s 0d On March 1st 1798, Sir Horatio presented himself again before the Court of Examiners of the Surgeons Company for the purpose of submitting this document The decision was that the amount was reasonable, and on that same day the following letter was sent to the Honourable Commissioners of His Majesty's Navy

Gentlemen

In pursuance of your letter of the 13th December we have examined into the claim made by Rear Admiral Sir Horatio Nelson for the expences attending the cure of his arm and we are of opinion that the sum of £135 1s 0d the amount of such claim being for chirurgical and medical expences is reasonable and proper to be allowed.

We are gentlemen your most obedient humble servants

J Earle	C Hawkins
Wm Long	Jos Warner
W Lucas	S Howard
Wm Cooper	G Chandler

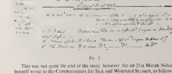


FIG 2

This was not quite the end of the story however for on 21st March Nelson himself wrote to the Commissioners for Sick and Wounded Seamen, as follows

Gentlemen

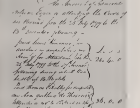
The Surgeons' Company not having filled up the blank opposite the Sick Quarters but told me that as they could not be judges of what was proper to be allowed to an officer of my rank they left it open for the decision of the proper board and as I apprehend this expence comes more immediately within the cognizance of your department I request you will give directions for my being allowed such a sum for Sick Quarters as you may think proper for an officer of my rank

I am etc

Horatio Nelson

It would seem that such a claim was somewhat unusual Certainly the Court of Examiners did not know how to meet it, and the above letter seems to have been passed to the Hon Evan Nepean Secretary to the Admiralty, for a note attached to it reads

> Own receipt and acquaint them that their Lordships do not think it right to allow him to make any charge for Sick Quarters and refer him to the Navy Board who will grant him such allowances as are proper to (be) made to him agreeably to H M Order in Council


"An Account of [illegible] Admiral Nelson [illegible] in attending the Cure of his Wound from the 25th July 1797 to the 13th December following –

Paid Lewis Remonier, for assisting in amputating his Arm & for Attendance from the 25th July 1797 to the 17th August following during which time he sat up the Nights — £ 25. 4. 0

Paid Thomas Eshelby for amputating the Arm quitting the Theseus & attending on him to England in the Sea Horse [illegible] from the 25 July to 3 Sept — 36. 0. 0

Fig 3

Acknowledgement

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J

Clinical Notes and Cases

THE INFLUENZA EPIDEMIC AND ITS CHEST COMPLICATIONS IN A LOCALIZED COMMUNITY

BY

Surgeon Commander L. G. TOPHAM, R.N.

THE following description is that of the pulmonary complications which followed an epidemic of influenza in the Juniors' Training Establishment at H.M.S. *Ganges* during the month of September, 1957.

In this establishment there are approximately 1,800 Juniors (formerly "boy ratings") and 600 ship's company, making a total of approximately 2,400 personnel (naval). During the period 6th September to 25th September, i.e. twenty days, there were 1,259 cases of epidemic influenza of the so-called "Asian flu variant." The maximum number that reported sick with the disease on any one day was 284, and the maximum total sick in bed on any day in this period was 732. As the Sick Quarters in H.M.S. *Ganges* only contained 156 beds, the remaining number of cases were nursed in separate "Sick Messes or Dormitories" in the establishment. Naturally, as soon as any patient was suspected of having any complications whatsoever, such as pulmonary, aural, etc., he was transferred immediately to a bed in the Sick Quarters, if not already being nursed there. The majority of the cases of influenza were those involving the Juniors (i.e. 15½–17 years of age), who had been accommodated in messes with approximately 40 personnel in each, but there were scattered cases amongst the officers and senior ratings living both ashore and in the establishment.

Before proceeding to the details of the chest complications of the epidemic, it is considered advisable to discuss very briefly the characteristics of the disease process itself.

In common with many epidemics which have been described in the medical journals, e.g. McCreadie's report on Asian Influenza in Kuwait [1], the explosive onset of the illness was characteristic, with a common variety of symptoms. Many ratings reported at 1700 to 2000 each day with temperatures of 103–104°, and complaining of headache, general malaise, tracheitis-type of cough, etc., but giving the history of having been fit and well on the morning concerned. It is considered that the symptomatology occurred in the following approximate order of frequency:

(1) Headache Present in all cases on the day of reporting sick

(2) General malaise In nearly all cases there was pain in the back and loins

(3) A dry, irritating, tracheitis-type of cough was also present in the majority of cases

(4) A return of generalized aches and pains with second peak of temperature occurred on the third day in less than half the cases, but was quite characteristic, even without the development of any recognizable complication

The absence of sore throat, i e dysphagia, was also very marked, although in Singapore reports a difficulty in swallowing had been a common symptom

There was also a marked absence of the post influenzal depressive state

The highest temperature recorded was 105° which occurred in about half a dozen individuals and the overall average duration of stay in the Sick Quarters was five days with two days on the School list—light duty" before return to normal duties

The routine treatment comprised the administration of aspirin 10 grains and mist expectorans 1 oz three times a day with the addition of other items in certain specific cases Antibiotics were only given to the cases with complications

Complications

Although there were a few cases of acute otitis media the chest infections provided by far the greatest number of these post-influenzal complications

Out of 1 259 cases of influenza there were 23 cases of acute pulmonary disease which developed as an immediate complication of the former illness i e 1 82 per cent Of the 23 cases 21 were juniors, and the remaining two comprised one officer and one ship s company rating These 23 cases can all be considered as localized segmental types of aspiration pneumonia with or without pleural involvement with the exception of one case which was a fulminant extensive pneumonia of bronchopneumonic type The predominating organism in this case was *Staphylococcus aureus* together with smaller numbers of *Hæmophilus influenzæ*

Clinical and Radiological

Of the 22 segmental types of pneumonia 6 were right sided, 15 left sided, and one involving both bases This is of considerable interest when one considers the anatomy of the bronchial tree and the fact that the right main bronchus leaves the tracheal bifurcation at a less acute angle than the left

Of the right-sided lesions it was considered that in 5 cases the posterior basal segments were involved with pneumonic consolidation, whereas one case was characterized radiologically by an enlargement of the right upper hilar shadow with peri-hilar flare and slight opacity extending into the right upper zone, probably the anterior segment of the right upper lobe (figs 1 and 2)

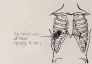


Fig 1

Fig 2.

When the left-sided pneumonias were reviewed, it was found that in 12 cases the basal segments of the left lower lobe were affected whereas in 3 cases, both clinically and radiologically the lingula was involved, with radiological opacities clearly confined to the upper segment of the lingula in 2 of the 3 cases In the bilateral case, the posterior basal segments were involved on both sides (figs 3 and 4).

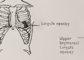


Fig 3

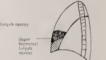


Fig 4

In the 22 segmental pneumonias it was possible to detect radiological and/or clinical signs of pleural involvement in 8 cases (6 left and 2 right), with minimal pleural effusion in 3 of these cases (2 left and 1 right), and pleural involvement extending into the main oblique fissure of the lungs in 2 other cases (1 right and 1 left)

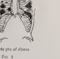
In the latter right-sided cases, the main fissure remained displaced posteriorly, with a partial degree of collapse of the right lower lobe for a considerable time, but is now slowly responding to treatment

These cases can be tabulated as follows

	Right	Left	Bilateral
Upper lobe	1	0	0
Middle lobe or lingula	0	3	0
Lower lobe	5	12	1 (plus 1 broncho pneumonia all lobes)
	6	15	2
		Total cases 23	
Pleural involvement	2	6	Total cases = 8
Effusion	1	2	(3 cases, included in the above 8)

The case of fulminant diffuse pneumonic consolidation was of particular interest and at one stage the patient was undoubtedly very seriously ill having a respiratory rate of 40–50 per minute in association with a marked degree of cyanosis Continuous oxygen was administered for a few days at the height of the illness, but as there appeared to be a satisfactory response to the therapy mentioned below the administration of cortisone or other steroids as has been described elsewhere in the treatment of staphylococcal pneumonias, was not considered to be indicated

Originally the patient developed small diffuse radiological opacities over the lower half of the left lung field which spread rapidly to involve the right side (fig 5) in spite of massive dosage with penicillin (8 mega units per day)



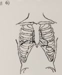
Height of illness

FIG 5

During this period the patient was running a high remittent temperature When the results of the sputum sensitivity tests were available these revealed that the predominating organism was a *Staphylococcus aureus* with a few colonies of *Hæmophilus influenzæ* both of which were sensitive to chloramphenicol, and partially so to aureomycin, the latter organism to streptomycin

in addition By this time both lung fields were heavily infiltrated, there being large, confluent opacities occupying the lower half of both sides and smaller scattered opacities throughout the upper parts of both lungs In addition there was a moderately large effusion on the right side, which proved to be sterile on culture, and contained only 5 cells per c mm all of which were lymphocytes Blood examination revealed a leucocytosis of 21 000 W B.C per c mm, with 74 per cent. polymorphonuclears and 8 per cent myelocytes There was slow but satisfactory response to the administration of a course of chloramphenicol 2 5 grammes and erythromycin 2 grammes daily for a period of ten days At the end of this period the patient still had a mild peak of evening temperature, and there were vague, small parenchymal opacities radiologically in the lungs The sputum still contained small numbers of *Staph aureus*, which were partially sensitive to aureomycin As it was not considered advisable to give further chloramphenicol he was prescribed aureomycin 2 grammes daily for a period of nine days In the course of time this produced a complete recovery

Three months later the only radiological abnormality was a mild flattening and elevation of the right diaphragmatic dome, with obliteration of the costophrenic angle (fig 6)



Final result

FIG. 6

During the month of the epidemic there must have been many cases of mild acute bronchitis following directly upon the influenzal illness but only four cases were admitted into the wards for symptomatic and antibiotic treatment. The others were treated as out-patients upon the Attending List At this point, it must be emphasized that in this investigation cases were only considered as pneumonia if there were both radiological and clinical signs of acute pneumonic consolidation. Some of the bronchitis cases mentioned above were probably pre-pneumonic, and there was, on occasion a radiological faint haze or loss of translucency in one small area of the lung fields

In addition to the above, there were also 3 cases of P R P U (Photoradiographic Pick Up) on routine 70 mm films, in Juniors who had missed their routine chest radiological examination on account of the influenza epidemic These 3 patients had all recovered clinically from influenza but radiological examination in each case showed a small area of opacity in the lower zone of one lung field, in keeping with a small area of pneumonic consolidation In all cases the Juniors were fit and well, and these opacities cleared with routine out-patient symptomatic treatment plus controlled breathing exercises, without any necessity arising for in-patient treatment

INVESTIGATION

It was not possible to carry out routine blood and sputum examinations during the illness in all the cases of pneumonia owing to the paucity of laboratory staff and to the fact that at all periods of the epidemic, considerable numbers of the Sick Berth Staff were patients themselves suffering from influenza

In the majority of cases however routine white blood cell counts showed a mild degree of polymorphonuclear leucocytosis, but in no case was the figure above 10 000 per c mm except in the staphylococcal pneumonia, where much higher figures were reached

Again in all the cases, except the latter above, culture of the sputum obtained on admission of the patient to the wards, and before therapy was administered, revealed growths of normal commensal organisms of the upper respiratory tract, such as various streptococci, *Hæmophilus influenzæ*, *Neisseria catarrhalis*, and certain types of pneumococci most of which were initially sensitive to both sulpha drugs, penicillin and the other broad spectrum antibiotics

TREATMENT

In an attempt to minimize the number of injections to be given by the staff (greatly reduced in the wards for reasons given above and also owing to their employment on duties in the " sick messes ") it was decided to administer sulpha drugs rather than penicillin to the earlier cases This was in addition to routine symptomatic chest treatment breathing exercises and postural drainage where indicated In 5 cases complete cure was thus obtained but in 9 other cases penicillin was also required and this then resulted in resolution of the pneumonic consolidation Later 7 cases were treated successfully with penicillin alone One patient (R U Z lesion) was given no antibiotic and the staphylococcal pneumonia had several broad spectrum ones Thus, in all the 21 cases given penicillin and/or sulpha drugs there was literally complete clinical and radiological resolution without the necessity for administering any further antibiotic

Three months later the only detectable abnormalities were the presence of a mild degree of radiological " tenting or peaking " of the diaphragmatic dome in 2 cases, a minor degree of posterior displacement of the main

pulmonary fissure in the one case with former lower lobe collapse, and the changes described above in the staphylococcal case

The final result of the epidemic has fortunately been very satisfactory Although there have been isolated cases of typical influenza and further patients with aspiration pneumonia and typical virus pneumonia, it can be stated definitely that there have been no additional cases of post influenzal pneumonia

REFERENCE

[1] McCreadie D W A *Brit med J* Vol 11 5046 p 684

AN UNUSUAL DIVING ACCIDENT

BY

Surgeon Commander S MILES, R N.

Serious accidents to standard divers are fortunately rare and it is the unusual circumstances and results of this case which merits its recording

The nightmare of the diving attendant is that of pulling a diver up and finding the helmet only coming to the surface with the diver left behind This actually happened

A sunken submarine lay on its side in 80 feet of water with its hatches below the horizontal A survey was being carried out on the wreck by salvage divers one of whom was investigating a compartment through the escape hatch Conditions were such that he could stand outside and work with his head and shoulders in the inverted hatch There was evidence to show that this compartment though flooded contained trapped air in its uppermost space and that corrosion of a tank had allowed oil fuel to accumulate on the surface of the water, the compressed air above which would produce ideal conditions for explosion

The diver had called for an oxy-electric torch to cut away an iron ladder which was hindering his work As a result of this an explosion occurred which was seen on the surface as a dome of gas and fuel oil and felt in a near by ship as if a heavy metal object had been dropped on an iron deck

Two attendants in the diving boat attempted to pull the diver to the surface but all they recovered was a battered helmet surrounded by a distorted metal sheet which was later identified as the inner face of the stowage for the escape twill trunking (fig 1)

The body was shortly recovered the diving suit was torn the metal corslet buckled, the left boot was missing and the toe cap and weighted sole of the right boot had been torn off (fig 2)

Fi 1

Fi 2.—Showing toe c p nd sole completely missing

A post-mortem examination showed multiple lacerations of the face, a hæmatoma of the scalp, a fractured nose and a broken denture. There was no skull fracture but the injuries were consistent with the damage to the helmet. Both tympanic membranes were ruptured.

Various superficial abrasions were found on the body and limbs with rupture of the left quadriceps muscle and a comminuted fracture of the right upper tibia.

Internally there was a large retro peritoneal hæmorrhage into the descending mesocolon and another round the brim of the pelvis. The viscera were intact.

An extensive subarachnoid hæmorrhage was found over both cerebral hemispheres and cerebellum.

The lungs were collapsed with extensive subpleural hæmorrhage. Lung tissue was normal and the trachea dry.

The most significant damage, however occurred in the spinal column where separation involving the intervertebral discs had occurred between the bodies of vertebræ C7 and T1, T3 and T4 and T11 and T12.

The pathologist concluded his report with the following statement.

"A violent hyperextension of the diver's body must have occurred causing damage to the posterior occipital area and the spinal injuries described above. It is doubtful how much of the retroperitoneal damage was due to the forcible hyperextension and how much to underwater blast. I am inclined to think that the latter was of minor importance in this case."

The final remark is entirely justified by the circumstances, for an explosion of compressed air and fuel oil would produce a relatively slow build up of pressure with no preceding shock wave as would be the case with a high explosive. The shock wave of a high explosive in water is more likely to produce multiple perforations and hæmorrhages of internal viscera without necessarily the massive tissue damage and distortion as in this case.

From the evidence of observers and the post mortem findings it was easy to reconstruct the accident. The diver with his legs and lower trunk outside the submarine would receive the full force of the explosion on his head and shoulders which were leaning forward into the hatch. The explosion also getting behind the inner twill trunk casing would tear this away and wrap it round the diver's helmet with such force that it was indented and sprung from its seating on the corslet. The upper part of the diver's body would be forcibly hyperextended by the explosion the pelvis and legs being out of direct range would be held back by water resistance and heavy boots. The final acceleration given to the body was sufficient to leave behind the more loosely laced left boot but in the more secure right boot the uppers were torn away from the weighted sole.

This case interesting for its rarity emphasizes the need for the salvage diver to appreciate the danger of possible accumulation of an explosive mixture being trapped in an old wreck and in such cases *a cutting torch must never be used* until the danger has been eliminated.

I am very grateful to Surgeon Lieutenant-Commander R S. Forrester, R N , for a most comprehensive post-mortem report, and to the photographer of H M S *Forth* for the excellent pictures

THE MANAGEMENT OF ACUTE APPENDICITIS

BY

Surgeon Lieutenant H. L. THOMPSON, R.A.N

This report is based upon 7 cases of acute appendicitis treated on board H M A S *Melbourne* during the Operational Tour of South East Asia from 17th March, 1957, to 12th July, 1957 These cases are considered to be of interest especially with regard to the poor results achieved by conservative treatment There was a marked difference in physical signs noted between cases and one was surprised how often the state of the appendix at operation was far different from what one expected from the clinical findings The value of *per rectum* examination is illustrated by the fact that in 3 cases there was definite tenderness on pressing upwards towards the right iliac fossa In only one case was the appendix situated in the true pelvis

All cases occurred within the period of one month from 10th April 1957 During the same period three cases of possible appendicitis were admitted to the Sick Bay for observation but these settled without treatment and on review, I feel that they were probably mild cases of gastro-enteritis No other cases of appendicitis, or possible appendicitis, occurred during the remainder of the cruise It is tempting to postulate that some dietary factor was contributory

Results of Treatment

Of the 7 cases, 6 required appendicectomy and only one settled on conservative treatment This was a relatively mild case of appendicitis One case (No 7) was operated upon immediately as he appeared to be extremely acute 5 cases were treated conservatively for a period of up to three days before a decision to operate was made Review of these cases after operation supports the decision to operate except in one case (No 4) where the appendix was only mildly inflamed

The results of treatment are tabulated as follows

(1) Number of cases	7
(2) Immediate appendicectomy performed	1 (onboard)
(3) Commenced on conservative treatment	6
(4) Conservative treatment successful	1
(5) Appendicectomy required after failure of conservative treatment	5 (3 onboard 2 B M H Singapore)

Conservative Treatment

Conservative treatment was as follows

(1) Bed rest—up toilet only

(2) Two hourly temperature and pulse chart

(3) Restricted fluids only by mouth

(4) Aqueous penicillin 1,000,000 units statim 500,000 units four hourly Streptomycin 1 gramme twice daily

Soneryl or nembutal combined with two A P C tablets were prescribed at night It was not considered advisable to prescribe pethidine or morphia for fear of masking symptoms and signs

Assessment of Progress

In assessing the progress of those cases treated conservatively the main emphasis was placed on the physical findings and in particular on the localization of tenderness and degree of rigidity The temperature and pulse rate were also invaluable These were taken in conjunction, as in some cases a rise in temperature was accompanied by a fall in pulse-rate If both temperature and pulse-rate were rising this was considered to be an unfavourable sign

Case Histories

Case 1—K R F aged 21 years reported to the sick bay on morning of 10th April 1957 and asked a Sick Berth Attendant for some A P C tablets for a headache This was refused and he was referred to see me He complained of headache and hot and cold feelings during the previous four hours It was not until I specifically asked him about abdominal pain that he admitted to pain in the region of the umbilicus over a similar period of time There had been no vomiting or diarrhoea

Past History—No history of similar abdominal pain

Physical Examination—He looked ill Temperature 100 Pulse 96. Tongue furred. Abdomen—slight tenderness and rigidity on very deep palpation in the right iliac fossa. *Per rectum*—acutely tender on pressure towards R I F

Treatment—Conservative

Progress—By 1200 his temperature had risen progressively to 102 but his pulse rate had fallen to 82 There were still no marked findings on examination of the right iliac fossa Decision to operate was made and operation was performed at 1400

Operative Findings—Appendix deep in pelvis but mobile and easily delivered into wound Appendix was acutely inflamed but not distended There was no evidence of suppuration

Post operative Course Uneventful Antibiotics continued for three days

Comments—A case of pelvic appendicitis The decision to operate was made on the general appearance of the patient the high temperature and the very definite tenderness P R The fall in pulse-rate despite a rise in temperature of nearly 3 is worth noting I feel that the decision to operate was the correct one in this case but having seen the state of the appendix at operation I feel that he may possibly have settled on conservative treatment

Case 2—B G D aged 21 years reported to the Sick Bay H M A S *Anzac* at 0130 on 10th April 1957 complaining of abdominal pains of three hours duration at first centred in the region of the umbilicus but later moving to the region of the iliac fossa He had vomited twice

Past History—No history of similar abdominal pain

Physical Examination (By L.S B A.)—Temperature [illegible] Pulse [illegible] Tongue coated Breath foul Tenderness and guarding R I F

Treatment—Observation only

Progress—Patient was transferred to H M.A.S *Melbourne* by Bosun's Chair at 0900 After transfer he looked quite well but stated that pain was becoming worse Temperature 99° Pulse 84 Tongue furred Tenderness in the R I F but only very slight rigidity P R—N A.D

Conservative management was commenced During the day his temperature slowly began to rise and he continued to complain of pain in the R I F By 1800 his temperature was 99 8 and pulse 86 The physical signs were unchanged A decision to operate was made and operation performed at 2000

Operative Findings—This appendix was situated on the posterior abdominal wall behind the caecum and ascending colon the tip being high up in front of the right kidney Many adhesions were present around the ascending colon caecum and terminal ileum which had to be divided to allow exposure of the appendix. The appendix was acutely inflamed and the tip gangrenous Owing to the difficulty in mobilizing the appendix the tip was perforated during removal

Post-operative Course—Uneventful Antibiotics were continued for five days No sign of peritonitis developed

Comments—It is interesting to compare Cases 1 and 2 from the point of view of the difficulty in assessing clinically the state of the appendix Both cases were admitted to the Sick Bay H M A S *Melbourne* at 0900 on the same day Case 1 looked very ill and his temperature rose to 102 by 1200 when a decision to operate was made Case 2 did not look particularly ill at any stage before operation and his temperature was only 99 8° at 1800 when a decision to operate was made In neither case were there marked physical findings At operation the appendix in Case 1 was acutely inflamed but not distended, but in Case 2 it was gangrenous at the tip and perforation would have occurred within a few hours

It is also worth noting the many adhesions present despite the absence of a previous history of abdominal pain

Case 3—J S aged 18 years reported to the sick bay on the morning of 16th April 1957 complaining of central abdominal pain of six hours duration Nausea but no vomiting present

Past History—Similar pain three years ago—sick on shore for two days—no diagnosis made.

Examination—Temperature 98 Pulse 80 Tongue furred Abdomen—tenderness and slight guarding right iliac fossa P R—tender on pressure towards R.I F

Treatment—Conservative

Progress—Steady improvement in symptoms and signs over the next two days Intermittent pyrexia never greater than 99 On arrival at Singapore on 18th April 1957 he was transferred to the British Military Hospital Tenderness and rigidity were minimal and he was considered to be settling well on conservative treatment

The journey to B M H Singapore involved a boat trip of about one mile followed by an ambulance ride of some two miles He was transferred as a stretcher case On arrival there the findings were as follows Temperature 99° Tenderness in the R I F A rectal examination elicited tenderness towards the R.I F A decision to operate was made immediately

Operative Findings—Free turbid fluid was present in the peritoneal cavity The appendix was acutely inflamed at the tip with mucosal ulceration and peritoneal exudate

Post-operative Course—Uneventful There is no record of whether or not antibiotics were continued

Comments—This case appeared to be subsiding slowly on conservative treatment prior to transfer to B M H Singapore but there is no doubt from the operative findings that

L

the condition was not progressing as well as one imagined by clinical signs. It is difficult to assess the effect of the journey but I do not think it could have caused much harm.

Case 4.—D. G. T., aged 18 years, reported to the Sick Bay on the evening of 16th April, 1957, complaining of nausea for four days and pain in the right iliac fossa for three hours. There had been no vomiting or diarrhœa.

Past History.—Similar pain in the right iliac fossa for two days in January, 1957.

Examination.—Temperature 99.8. Pulse 88. Tongue furred. Abdomen—tender in the right hypochondrium and above the R.I.F. No guarding. P.R.—N.A.D.

Treatment.—Conservative.

Progress.—By the next morning his temperature and pulse rate were normal. Still tender and slightly rigid above R.I.F. The picture was unchanged on 18th April when on arrival at Singapore he was transferred to the British Military Hospital. He was considered to be settling well on conservative treatment.

After transfer he remained quiescent, apart from occasional stabs of pain, for two days. His temperature and pulse rate were consistently normal. Conservative treatment was continued. On the evening of 19th April he complained of more acute pains in the R.I.F. On physical examination there was definite tenderness on deep pressure on the R.I.F. but no guarding, and on P.R. examination definite tenderness and pain in the R.I.F. on pressure to the right. A decision to operate was made.

Operative Findings.—Appendix long with tip lying in the pelvis. Mildly inflamed.

Post-operative Course.—Uneventful.

Comments.—This case demonstrates the failure of conservative treatment after a period of three days of apparent success. The condition may have settled on continuance of conservative treatment, but few doctors would make this decision.

Case 5.—V. J. S., aged 19 years, reported to the Sick Bay, H.M.A.S. *Anzac*, on afternoon of 24th April, 1957, complaining of abdominal pain of five hours' duration, centred in the right iliac fossa. He also complained of nausea and anorexia for the previous four days and had vomited once on the night before reporting.

Past History.—Intermittent attacks of pain in the right iliac fossa, not normally associated with vomiting, over the previous two years. He was an in-patient, Flinders Naval Hospital, for one week in November, 1956—no diagnosis made.

Examination (By L.S.B.A.).—Temperature 98.4. Pulse 72. Tongue clean. Tenderness and guarding in the right iliac fossa.

Treatment.—Conservative.

Progress.—Patient was transferred to H.M.A.S. *Melbourne* by sea boat at 1600 on 25th April. On arrival temperature 99.8, pulse 90, tongue furred. Tenderness but little rigidity in the right iliac fossa. P.R.—N.A.D. Conservative management continued but antibiotics were stopped. His temperature fell to normal that night but again rose to 99.4°, pulse 80, next morning. He now complained that the pain was worse and, on examination, tenderness was more marked and localized. It was decided to operate and the operation was performed at 1400, 26th April, 1957.

Operative Findings.—The appendix was retrocæcal and densely bound down by adhesions. It was acutely inflamed and stenosed by fibrosis about half way along its lumen. Distal to the stenosis the appendix was distended and full of inspissated fæces and pus.

Post-operative Course.—Uneventful.

Comments.—This appendix would have perforated had appendicectomy not been performed. By this stage we were a bit wary about conservative treatment and antibiotics were stopped on his arrival on board H.M.A.S. *Melbourne*. This allowed the condition to become more florid and force a decision to operate. Without a doubt continuance of conservative treatment would have failed.

Case 6. D. A. F., aged 23 years, reported to the Sick Bay [illegible] April 1957 complaining of abdominal pain of six hours duration. [illegible] right iliac fossa. There had been no vomiting or diarrhoea.

Past History.—No history of similar abdominal pain.

Examination.—Temperature 98.8. Pulse 76. Tongue furred. [illegible] right iliac fossa. No rigidity. P.R.—N.A.D.

Treatment.—Conservative.

Progress.—Pain lasted for eighteen hours after admission, gradually becoming less severe. At the end of this period the temperature and pulse rate were normal but there was still localized tenderness in the right iliac fossa. On the evening of 28th April there was an evening rise of temperature to 99.6, but no recurrence of pain or other clinical change. There was still localized tenderness in the right iliac fossa on 29th April, but all signs had vanished by 30th April when treatment was stopped, mobilization commenced and light diet instituted. He was discharged to full duty on 2nd May 1957.

Comments.—A mild case and the only one in this series where conservative treatment was successful.

Case 7. W. N. B., aged 25 years, reported to the Sick Bay on the morning of 7th May complaining of central abdominal pain of four hours duration. There had been no diarrhoea or vomiting and he had no previous history of similar abdominal pain. At this stage his temperature was 98, and pulse rate 72. Clinical examination, including P.R., was entirely negative. At 1500 the same afternoon he had a rigor and the pain became worse, shifting now to the right iliac fossa.

Examination.—Temperature 104. Pulse 116. Tongue furred. Abdomen marked tenderness and rigidity in the R.I.F. P.R.—tender on pressure towards R.I.F. Chest—clear.

Admitted to Sick Bay and decision to operate made immediately.

Operative Findings.—The appendix was retrocaecal and bound down to the posterior abdominal wall by dense adhesions. These adhesions also involved the terminal ileum and caecum, making mobilization difficult. Retrograde dissection was obligatory. The appendix was acutely inflamed and swollen, the tip was gangrenous. When opened after operation there was a considerable quantity of pus present in the lumen.

Post-operative Course.—Penicillin and streptomycin were given for five days after operation. No complications developed. The temperature returned to normal about 72 hours after operation.

Comments.—This is a most unusual case from the point of view of the rigor onset and the absence of physical signs in the early stages. The patient was examined carefully when he first presented with appendicitis in mind. Rigors must be rare indeed in adult cases of acute appendicitis. When he presented on the second occasion he was flushed, a bit hyperpnoeic and the alae nasi were working. The immediate impression was that he had pneumonia and this was only excluded after the physical examination. Once again one notices the presence of adhesions despite no previous history of abdominal pain.

Discussion

It is standard teaching that all cases of acute appendicitis should be treated by appendicectomy. However, with the introduction of a wide variety of antibiotics it is tempting to treat these cases conservatively, particularly when circumstances are not ideal for operative treatment. In addition, one had been impressed by the small amount of macroscopic inflammatory changes present in the appendix when removed from many definite cases of acute appendicitis. Sometimes one is doubtful as to the correctness of the diagnosis but there is no doubt that the operation cures the patient of his symptoms and signs. It is therefore reasonable to consider that most cases would respond to antibiotics provided the bowels are rested during their administration.

Coldrey (1956) has treated 137 cases of acute appendicitis of more than twenty-four hours' duration by conservative measures, with only two fatalities In both fatal cases there were complications before arrival in hospital Extending this policy he has treated a number of cases of acute appendicitis received within twenty-four hours and is satisfied that the condition can be safely and certainly dealt with in this manner He states "One cannot help feeling that all cases of acute appendicitis occurring away from skilled surgery and adequate surgical surroundings are best treated conservatively The unskilled surgeon will be saved a lot of anxiety and the patient have a better chance of survival"

Although our series of cases is a very small one I feel justified in drawing some conclusions from it I am most disappointed with the results of conservative treatment and consider that all cases should be admitted to appendicectomy as soon as the diagnosis is established and adequate facilities are available It must be admitted that these 7 cases were on the whole, more than usually acute However, I have found that it is very difficult to judge clinically, the state of the appendix In those cases with very marked physical signs the appendix was often less acutely inflamed and distended than in those cases with less marked physical signs

The position at sea is rather a difficult problem to discuss as treatment will depend upon circumstances We were fortunate in having adequate staff and theatre facilities to treat our cases surgically if necessary I feel that whenever two or more medical officers are available a decision to operate should normally be made The question of whether operations should be covered by an umbrella of antibiotics should depend upon the operative findings

With regard to suspected or doubtful cases of appendicitis I am in favour of conservative management I consider that in no circumstances should antibiotics be administered until a definite diagnosis of appendicitis has been established The treatment then depends upon the facilities available

One further point worth mentioning is the question of transfer of patients from a ship to shore and from ship to ship This I consider should be by stretcher whenever possible It was noted in two cases that there was an increase in temperature following the disturbance caused by ambulant transfer In one case this was from 98·2° to 99·8°, and in the other from 98° to 99°

SUMMARY

This report deals with a series of 7 cases of acute appendicitis treated on board H M A S *Melbourne* In most cases conservative treatment was given a trial but failed in all but one case

The results of treatment are analysed and the case history of each case given in detail

The position regarding conservative treatment is discussed and it is concluded that operative treatment is preferable provided reasonable facilities are available

REFERENCE

COLDREY E. (1956) *Brit med J* **2**, 1458

Reviews

The Design and Construction of Removable Orthodontic Appliances By C Philip Adams B D S F D S, D Orth Lecturer in Orthodontics Queen's University, Belfast Consultant in Orthodontics Belfast Teaching Hospitals Second Edition Pp 120 with illustrations. Bristol John Wright and Sons Ltd Price 21s 0d.

The second edition of this sensible manual maintains the lucid arrangement remarked in its predecessor together with extra chapters dealing with expansion and welding, a number of new illustrations and a more substantial cover The diagrams and photographs are so well illustrated as to make the text unnecessary in many cases and to remove all ambiguity between surgery and laboratory

The emphasis throughout is on the appliance rather than the mystique of orthodontic thought and the avowed object is to provide a guide between an observed deformity and the means of its correction At all times it is stressed that the movement of teeth is the result of mechanical pressure and thus even the Andresen appliance falls into place as a logical transmitter of predictable forces

In form, therefore the main body of the book consists of sections dealing in turn with the usual required movements of teeth labio lingual mesiodistal rotation and so on together with a description of all the acceptable choices of method for procuring them These chapters are supported by others dealing with mechanical principles of orthodontic appliances and the laboratory technique for their construction

The author exhibits a consideration towards his simpler readers which is both reassuring and wise He does not hesitate to advise for instance that before attempting to move an incisor forward over the bite it should be ascertained that there is in fact room for it in the arch He continues throughout to lead the occasional orthodontist through pitfalls that might trap an inexperienced operator or a technician unfamiliar with orthodontic requirements.

A thoroughly useful manual stripped to the essentials but always convincing and moderately priced it is not surprising that there has been demand for a second edition

The Early Diagnosis of the Acute Abdomen By Sir Zachary Cope B A M D M.S.London, F.R.C S England Consulting Surgeon St Mary's Hospital Paddington Eleventh Edition Pp 154 plus index Coloured frontispiece plate 8 plates of radiographs and 36 figures London Oxford University Press Price 18s 0d. net

This well known classic has been completely revised and enlarged and emerges with its structure even further increased It is easily read and is packed with essential information which arises from the distinguished author's vast experience and long study of the problems presented in acute abdominal disease

The figures in the text are eye-catching and informative and the radiographs are excellent in reproduction and selection

The book has for long been recommended to all medical students Those colleagues responsible for the admission and diagnosis of acute abdominal cases for instance casualty officers house surgeons and junior registrars (or their Service equivalents) could read it with profit more than once and in the reviewer's case it is still a pleasure and help to read it after practising for some years the diagnosis of the acute abdomen

Any criticism of such a standard work can only be of minor degree but the following relatively small points are put forward with considerable diffidence

(a) In Chapter III under "examination of the patient" not only the attitude of the patient but also his movements and manner of speech might be worthy of notice. The reluctance to move at all evinced by the classic perforated peptic ulcer case is matched by his quiet or even whispering speech while the restless sufferer from severe colic is often loudspoken or even noisy

(b) Also in Chapter III it is suggested that the section on abdominal examination should include under "inspection" the advisability of a survey for visible peristalsis and that the value of auscultation in many abdominal cases might be mentioned here as of course it is in later chapters where appropriate

(c) In Chapter VII in discussing acute pancreatitis it might be worthy of note that there is sometimes an associated enlargement of the gall bladder. Therefore tenderness in the right upper quadrant may be noted while the patient remains under observation and later the fundus of the gall bladder may be palpable

(d) Visible peristalsis is discussed in Chapter VIII. It is noted to be a normal finding on occasions if the patient has a thin abdominal wall it is sometimes a normal finding, too in cases of megacolon

(e) In Chapter X inflammation of the colon—phlegmonous colitis—though rare, might be mentioned

(f) Chapter XVI The colics. Under lead colic the old assertion might be noted that this form of colic is the only one to be associated with a high or raised blood pressure

(g) Chapter XVIII Abdominal symptoms due to salt deficiency. This used to be a common complaint in the Royal Navy the sufferers being invariably young stokers working in the steaming boiler rooms of ships in hot climates. The most rapid method of making good such a salt deficiency is a one pint saline enema to be retained which gives dramatic relief

(h) Chapter XIX. A right epididymitis can be accompanied by pain in the right iliac fossa with muscle tenderness and resistance therein

(i) In Chapter XXI diseases which may simulate an acute abdomen acute porphyria might be worthy of mention especially as it is relatively more common in certain countries—for instance the Union of South Africa—than in the British Isles

This book will deserve the gratitude of surgeons everywhere for many years to come

RECENT TRENDS IN CHRONIC BRONCHITIS Edited by Neville C Oswald T D M D Cantab F R C P Lond Physician St Bartholomew's and Brompton Hospitals London Honorary Physician to H M the Queen Pp vii + 199 with 74 charts and illustrations and 15 tables London Lloyd-Luke (Medical Books) Limited Price 30s 0d net

Dr Oswald has edited this new volume on chronic bronchitis and he contributes four chapters on mortality and morbidity the clinical pattern mucus and clinical management In the remaining eight chapters his colleagues at a special Out Patient Clinic for bronchitic patients at the Brompton Hospital cover the pathology bacteriology radiology and cardiology of chronic bronchitis with an additional chapter on the importance of atmospheric pollution and Dr John Horder stresses the special problems of the general practitioner

This book is well produced and clearly written containing much information in less than 200 pages although the short bibliography at the end of each chapter could have been extended without altering the character or size of the work. The reproduction of radiographs are excellent but the coloured illustrations of microscopical sections are too small and suffer because their legends are on a different page

Dr Oswald and his colleagues have provided an excellent and concise account of modern opinion on the various aspects of chronic bronchitis which is a clinical problem of increasing importance with an ageing population

BRITISH MEDICAL BULLETIN Vol 14 No 1—ANAESTHESIA Pp. 77 London The British Council Price 20s 0d

This edition of The British Medical Bulletin is devoted to Anaesthesia and consists of 16 papers dealing with a variety of subjects both scientific and clinical

The papers on the physics of rebreathing in anaesthetic systems show how much experimental work is now being done towards the design of modern equipment

The papers on the clinical aspect are excellent and should be of great benefit to all anaesthetists These include articles on controlled hypotension induced hypothermia obstetric and neonatal anaesthesia and anaesthesia in burns

The paper on The Treatment of Respiratory Inadequacy which deals with respiration in poliomyelitis tetanus and narcotic poisoning should be of great interest to all medical officers whatever their special field of study

GASTRO-INTESTINAL OBSTRUCTION By Meyer O Cantor M D and Roland P Reynolds M D F A C S First Edition Pp 502 with 415 figures in the text including numerous diagrams and reproductions of radiographs London Bailliere Tindall and Cox Ltd Price 18 dollars

This is an extremely well produced work, encyclopaedic in scope It is of interest to the practising surgeon rather than to the student, but it will also prove of considerable use as a work of reference.

The subject is very thoroughly dealt with starting with the histological aspects and working through embryology anatomy and physiology to the study of obstruction affecting various parts of the alimentary tract

The chapter on Radiological Diagnosis of Gastro intestinal obstruction is especially helpful The discussion on Distension in the Gastro intestinal Tract is of great interest and there is a full study of gastro-intestinal Intubation

It is especially interesting to note the methods for passing long intestinal decompression tubes and the approximate failure rates in those cases where the pylorus is not passed

The remarks on the effect of morphia upon the tone and function of the bowel are full of interest Also of practical interest is the description and method of use of the Cantor Intestinal Decompression Sound

The work is worth a place in the reference library of any large hospital

TEXTBOOK OF MEDICAL TREATMENT Edited by D M Dunlop B A.(Oxon) M D F R C P (Ed) F R C P (London) Sir Stanley Davidson B A (Camb) M D F R C P (Ed.) F R C P (London), M D (Oslo) S Alstead M D F R C P (Ed) F R C P (London) P R.F P S Seventh edition Pp xix + 924 Edinburgh and London E. & S Livingstone, Limited Price 55s 0d net Home postage 2s 3d

This book must be an old and valued friend to many doctors It is now in its seventh edition and has undergone a change in editorship—Sir John McNee has retired and his place has been taken by Professor Alstead of Glasgow University

The book has been entirely revised and new chapters added on cortisone and corticotrophin and on anticoagulants One finds it difficult to select any section for special praise but that on the anaemias and the beautifully written dissertations on the ductless glands are outstanding

Despite the ever increasing complexity both of diagnosis and of methods of treatment in contemporary Medicine this book remains lucid, extremely informative and readable—a characteristic which so many technical books lack It is considered to be without doubt the best book of its kind and should form a corner stone of anyone s medical library.

BIOCHEMICAL INVESTIGATIONS IN DIAGNOSIS AND TREATMENT. By John D. N. Nabarro, M.D., F.R.C.P., Assistant Physician, The Middlesex Hospital. Second Edition. Pp. xii + 299 with illustrations. London: H. K. Lewis and Co. Ltd. Price 25s. 0d. net.

This medium-sized book has much the same format as its popular predecessor. New material includes acetazolamide as a diuretic in corpulmonale and 5 hydroxytryptamine in carcinoid tumours. The chapters on metabolic acidosis and the adrenal glands have also been brought up to date.

Chapter One should be learned by heart by all budding surgeons, and Chapter Nine on diseases of the liver and biliary tract is a good guide to biochemical investigations in liver disease.

For its cost it is extremely good value and can be highly recommended. It passes the acid test of being readable in bed.

We acknowledge with thanks receipt of the following publications

Acta Medica et Biologica. Alfred Hospital—Clinical Reports Vol. 7 1957. Annales Medicinae Internae Fenniae. Annals of Tropical Medicine and Parasitology. Annual Report of the Central Research Institute Kasauli 1953–54. Annual Report of the Research Institute of Environmental Medicine, Nagoya University. British Medical Bulletin. British Medical Journal. Bulletin of the World Health Organization. Chinese Medical Journal. Chronicle of the World Health Organization. Guy's Hospital Gazette. Journal of the Royal Army Medical Corps. Journal of the Royal Naval Scientific Service. Middlesex Hospital Journal. Military Medicine. Montreal Medical. Nagoya Journal of Medical Science. Proceedings of the Staff Meetings of the Mayo Clinic. Revue Internationale Des Services De Santé. Revue de Medecine Navale. Rivista di Medicina Aeronautica. St Mary's Hospital Gazette. St Thomas's Hospital Gazette. The Australian Journal of Experimental Biology and Medical Science. The British Journal of Surgery. The Broad Way—Westminster Hospital. The Bulletin of Tokyo Medical and Dental University. The Gunma Journal of Medical Sciences. The Journal of Nara Medical Association. The Kumamoto Medical Journal. The Medical Press. The Tohoku Journal of Experimental Medicine. The Ulster Medical Journal. Tropical Diseases Bulletin. University of Birmingham 28th Annual Report. University of Durham Medical Gazette. Yokohama Medical Bulletin.

News of the Service

OBITUARY

Surgeon Rear Admiral Samuel Gerald WELDON *C.B.E.* M.B. B.Ch. D.P.H. Q.H.P. died suddenly at the Royal Naval Hospital Bighi on 11th January 1958 when he was Medical Officer in Charge. He suffered a serious illness in 1944 which he overcame as a result of suitable therapy, good care and perseverance, but for some time before his death he struggled bravely against indifferent health. His sudden death, however, came as a great shock to his many friends.

He was born on 3rd February 1900 at Linzetown, Co. Wexford, Eire, and was educated at St. Bees School, Cumberland, and the University of Dublin, Trinity College. He qualified with the degrees of B.A., M.B., B.Ch., B.A.O. in 1922. He then became House Physician of the Monkstown Hospital, Dublin, and at the same time took the D.P.H. of Trinity College, Dublin, and the L.M. of the Rotunda Hospital.

He joined the Royal Navy as a Surgeon Lieutenant in September 1923. He served in several of H.M. Ships and then specialised in Clinical Pathology in 1931 and was appointed to the R.N. Hospital, Plymouth. The ships he had served in were H.M. Ships *Marlborough*, *Revenge* and *Veronica*. The commission in the latter ship he enjoyed very much as she served in New Zealand and the Pacific. In 1934 he became Naval Medical Officer of Health, Mediterranean Station, where he stayed for nearly three years. In 1937 he was appointed Clinical Pathologist at the R.N. Hospital, Haslar. The war found him at sea in H.M.S. *Medway* which was stationed in the Far East but moved much nearer home later on. He became Medical Specialist at Haslar in 1942 and he worked very hard and thoroughly in this appointment, not sparing himself one iota. He then broke down and had to have sanatorium treatment for about six months. Patience and dogged determination helped greatly to win the day and he was made Naval Medical Officer of Health, Mediterranean Station, for the second time in 1946. In 1949 he became Naval Medical Officer of Health, Plymouth Command. This is a large Command and he worked diligently and unsparingly far beyond his physical capacity. At the beginning of 1956 he was promoted Surgeon Rear Admiral and appointed Medical Officer in Charge of the R.N. Hospital, Bighi, Malta. He was also Medical Adviser to the Commander-in-Chief Allied Forces, Mediterranean.

He was appointed *C.B.E.* in 1953 and Queen's Honorary Physician in 1956. He also became an Officer of the Most Venerable Order of St. John of Jerusalem in 1955.

He is survived by his wife, a son and a daughter.

The above is a brief account of an interesting and varied career. He not only had been a Clinical Pathologist and Naval Medical Officer of Health, but also a Medical Specialist. This shows unusual ability and versatility in professional matters.

Gerry was a well-liked personality and was very good natured and kind. He was very keen on the Service and not only attended to his work in a thorough and exemplary manner, but never neglected the social side of Service life. His sense of humour was such that a stranger might think that he didn't take his work very seriously, but he would very soon and quickly be disillusioned. He took most things in life seriously but his Irish wit and kindly humour were seldom far from the surface.

The funeral took place at the Capuchin Cemetery, Bighi, on Tuesday 14th January,

1958 The funeral service was held prior to the *cortège* forming up at Fort St Roccq, at St Luke's Church Bighi The Rev Charles de Candole Chaplain of R N Hospital, Bighi conducted the funeral service and the graveside service which followed The chief mourners were Mrs Weldon Miss Victoria Weldon and Sub-Lieutenant J G St L. Weldon, Royal Navy Others present were His Excellency the Governor and Lady Laycock the Commander in Chief Mediterranean and Lady Lambe Flag Officers and their wives of the three British Fighting Services and Allied Services as well as many other Service Officers and their wives Important civil personalities in the life of Malta were also present

The deepest sympathy is extended to his wife and family

It is with sorrow that we record the sudden death of Surgeon Captain GRAFF R N on 20th March 1958, while engaged in the duties of his appointment as Medical Officer in-Charge R N Medical School

Robert Archer Graff had become a name to conjure with in the R N Medical Service which he entered as a Surgeon Lieutenant in 1928 His record at medical school had been a brilliant one and it soon became clear that his Service career was to match it His interest was in clinical medicine and he equipped himself for its pursuit by diligent and selective study In the nineteen-thirties he was a member of one of the last 'Promotion courses' to be held and earned for himself the coveted year's acceleration During the war years he occupied a key position on the staff of the Medical Director-General, and followed this by a spell as R N Medical Liaison Officer in Washington His success in the latter appointment can be gauged by the fact of its extension on two occasions, prior to his eventual return to the United Kingdom in April 1950

Promoted Surgeon Captain on 31st December 1950 he assumed the duties of Director of Medical Research at the R N Medical School and then returned to the Medical Department in June, 1952 for a further period of administrative service From August 1954 to January 1958 he was S M O (M) at R.N Hospital Chatham

His eventual return to R N Medical School as Medical Officer in-Charge was a natural culmination and appeared to us all to offer just the right opportunity for disseminating his accumulated store of academic and administrative wisdom It is our great loss that he was not given the time for it

Here was a unique man with a shrewd analytical mind eager to probe and to follow but impatient of the mediocre. If it seemed at times that he held aloof from the surging herd it was perhaps because of his self imposed high standards His integrity and sincerity were above all question

Surgeon Captain J O HEA R N Rtd died on the 11th January 1958 at the age of 82 Born on the 9th July 1875 he qualified M R C S Eng L R C P Lond in 1899 and entered the R N Medical Service as a Surgeon in 1900 He was promoted to Staff Surgeon in 1908 and Surgeon Commander in 1914 and was placed on the Retired List on the 9th July 1925 with the rank of Surgeon Captain

During World War I Surgeon Captain O Hea served in H M Ships *Cumberland Neptune* and at the Isle of Grain Air Station In 1919 he was awarded The Order of the Crown of Belgium

He was employed in H M S *President* as Inspecting Officer of First Aid Organizations from 2nd February 1940 till he reverted to the Retired List on 27th December 1945

HONOURS AND AWARDS

Queen's Honorary Physician

Surgeon Captain R S Rudland, *V R D* R N V R

HIGHER DEGREES

Diploma in Clinical Pathology—Surgeon Lieutenant Commander C O L Hughes R N
Diploma in Industrial Health—Surgeon Lieutenant Commander H R Mallows R N
Diploma in Laryngology and Otology—Surgeon Lieutenant R R A Coles R N
Fellow Royal College of Surgeons—Surgeon Lieutenant J R Kirkpatrick R N
Fellow in Dental Surgery—Surgeon Lieutenant Commander (D) G J Boyd, R.N

PROMOTIONS

To Surgeon Rear Admiral—D F Walsh *O B E* (20 1 58) G Phillips (23 6 58)
To Surgeon Lieutenant Commander—P H Lovell (1 2 58)

TRANSFERS TO PERMANENT LIST

Surgeon Lieutenants—J G Bradford P C Fulford.

ENTRIES FOR SHORT SERVICE COMMISSION

J M Anderson M B Ch B D E R Bateman M B B Ch. M W B Bradbury B M B Ch V R Bruce M B B S E D A Hay B M B Ch. H V Hughes M B B S M R C S L R C P T J King, M B B S J R Marshall M B B Ch P B Odgers, M B Ch B D G Twyman M B B Ch C A Brookes B D S L D S J Catcheside, B D S D F J Chapman Andrews L D S

TRANSFERS TO SHORT SERVICE COMMISSION

Temporary Acting Surgeon Lieutenant A J Rintoul

RETIREMENTS

Surgeon Captain J G Maguire *C B E*
Surgeon Commander (D) T G A C Emberson
Surgeon Lieutenants—L M Davis J M London J K S Mackay C Ward
Surgeon Lieutenant (D) P J Wege

WARDMASTER OFFICERS

PROMOTIONS

To Acting Wardmaster Sub Lieutenant—G C Hamilton S B C P O C/MX 56629 (1 2 58) D R James S B C P O C/MX 52668 (11 2 58) N Sansom S B C P O D/MX 802092 (12.2.58) J H T Willocks S B C P O D/MX 109425 (17 2.58)

RETIREMENTS

Wardmaster Sub Lieutenant S Owens

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

PROMOTIONS

To Principal Matron—Miss N M Willoughby *A R R C*
To Superintending Sister—Miss M M Ashby

TRANSFERS TO PERMANENT LIST

Senior Nursing Sisters—Miss P J O'Reilly Miss S H Way

NAVAL MEDICAL COMPASSIONATE FUND

ACCOUNT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31st DECEMBER, 1957

	£ s d	£ s d
Balance at Bank on 31st December 1956		872 5 8
Dividend on 2½% Consolidated Stock	265 0 0	
Interest on 3½% Conversion Stock	66 10 0	
Interest on 4% Consolidated Stock	40 0 0	
Interest on 3½% War Stock	35 0 0	
Interest on 4½% British Electricity Stock 1974/79	71 14 0	
Interest on 4½% British Electricity Stock 1967/69	12 3 2	
		490 7 2
Refund of Income Tax on 4½% British Electricity Stock 1974/79		2 15 2
Interest on Deposit Account		9 9 2
Subscriptions		268 16 0
Donations		7 7 0
		£1 651 0 2

	£ s d	£ s d
Awards to Widows and Orphans		361 0 0
Clerical Assistance		38 10 0
Auditor		1 1 0
Purchase of £540 8s 8d British Electricity 4½% Guaranteed Stock 1967/69		500 0 0
Balance at Bank on 31st December 1957		
Deposit Account		309 9 2
Current Account		441 0 0
		£1 651 0 2

I certify that I have examined the above Account of Receipts and Payments and found it to be correct and in accordance with the books and records of the Fund and that all my requirements as Auditor have been met

Certificates of the Stocks standing at the Bank of England in the names of the Trustees on 31st December, 1957, and of the Balances on Current and Deposit Accounts at the National Provincial Bank Limited on that date are attached

The Balance of £441 0s 0d on Current Account includes the sum of £35 10s. 0d awaiting investment on account of the Donation Fund

Subscriptions received during the year include £29 8s 0d in respect of arrears for previous years

Subscriptions unpaid at 31st December 1957, amounted to £4 4s 0d in respect of the year ended on that date

Sgd. Wm C McNicol
Chartered Accountant,
Auditor
6th February, 1958

In addition to the above Cash Balance Stock to the following amounts were standing at the close of Accounts at the Bank of England in the names of the Trustees

*	£10 600	2½% Consolidated Stock
†	£1 900	3½% Conversion Stock.
†	£1 000	4% Consolidated Stock
†	£1 000	3½% War Stock
†	£1 687 5s. 1d.	4½% British Electricity Guaranteed Stock 1974/79
†	£540 8s 8d	4½% British Electricity Guaranteed Stock 1967/69

*Original Fund under Clause 5 of the Order in-Council of the 26th July, 1915

†Invested out of accumulated interest and subscriptions.

Sgd. R L G Proctor
Surgeon Rear Admiral
Honorary Treasurer
22nd January, 1958

Nature

AMES COMPANY (London) Limited announce the introduction of two new simple diagnostic tests

"*ALBUSTIX*" *Reagent Strips* The first colour test for urine protein An impregnated paper stick is dipped into the urine—an immediate colour indicates a positive test and this can be compared with the colour scale as a guide to the amount of protein present Even cloudy urines can be tested without filtration ' ALBUSTIX' is ideally suited for routine urine testing as one test only takes a few seconds

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Supplied in bottles of 50 tablets

ADMIRALTY FLEET ORDERS—1958

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73.—Medals, Decorations, Honours—"London Gazette" of 31st December, 1957

74.—Medals, Decorations, Honours—New Year Honours List, 1958.

85.—Surgeons and Agents

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138.—Medical—R.N. Miniature-film Radiographic Mobile Unit—Administration.

152.—Films and Filmstrips—Instructional—Titles—"Resuscitative Care of the Severely Wounded" (Serial No. T.F.8/2198), "Debridement, Parts 1 and 2" (Serial Nos. P.M.F. 5304 and 5305), "Initial Surgery of Abdominal Wounds" (Serial No. P.M.F. 5306), "First Aid," Part 1 (Serial No. T.F.8-2292)—Distribution.

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883.—Medical, Dental and Hospital Consultants

908.—Medical Stores—Introduction of Combined First Aid and Survival Kits.

Notice

The [illegible] medical [illegible] to send in original [illegible] subjects travel personal experiences &c Items of news and matter [illegible] the naval medical service will be welcomed from ships and establishments on home and foreign stations Notices of births marriages and deaths are inserted free of charge to subscribers

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The Harvard system should be employed for bibliographical references these references being arranged in alphabetical order of the authors names at the end of the contribution thus Smith F G (1935) *J roy nav med Serv* 22, 53 In the text a reference to a publication should be cited by giving the author and in brackets the date thus Smith (1935) believed this to be due &c

The Journal is published quarterly four numbers comprising one volume

Articles and communications may be sent to the Editor at any time **They should be clearly written or, preferably, typed and sent in duplicate** to The Editor R.N Medical School Alverstoke Hants

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For all others who are *not* in the above categories the subscription is 24s per annum (postage included) or 6s per single copy

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VOLUME XLIV SUMMER 1958 No. 3

Journal
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Royal Naval Medical Service

Articles

CURRENT PROBLEMS IN UNDERWATER MEDICINE[1]

BY

Surgeon Commander S. MILES, R.N.

It must be emphasized that underwater medicine is not a speciality remote from other fields. It is indeed basically environmental physiology and throughout its application the same techniques, the same ideas and the same physical principles are used as in any other branch of environmental research be it clinical, climatic, aero medical or industrial. So too will achievements in underwater research contribute in some measure to progress in these other spheres.

Scientific and mechanical development in recent years has produced means which enable man to exist actively and travel in environments which normally would not support life. In aviation, space travel and even under the sea, the range of activity is restricted by the physical limits of human tolerance rather than the capabilities of the vehicles in which he may travel.

Diving apparatus and submarines have been developed which can take man deeper and for greater lengths of time than he himself can endure. Thus it will be seen that current problems in underwater medicine demand the study of man's responses to the new environments.

In underwater medicine there are two major environments to be considered. First that of the submarine where, though the air in the vessel remains at atmospheric pressure when submerged, it cannot be refreshed from without and equipment must be carried for production of oxygen and removal of carbon dioxide and other noxious agents. The advent of the nuclear submarine with prolonged underwater cruising will greatly magnify these problems. Lieutenant-Commander Ebersole (1958) of the U.S.N., has recently

[1]A paper read before the United Services Section of the Royal Society of Medicine on 5th June, 1958.

given a full account of this subject to the Society so I will pass directly to the second environment that of the diver

Whether the diver be free swimming, taking his atmosphere in bottles with him or whether he be supplied from the surface in the conventional method, the air must be supplied to him at a pressure equal to that of the surrounding water The human body submerged behaves as an incompressible fluid its tissues taking on the equivalent pressure without deformity or conscious change The air in the lungs is, however, compressible and therefore, for normal functioning must be supplied at greater pressure and volume This in turn means that both nitrogen and oxygen will dissolve in the blood and pass into the tissues in greater amounts than those to which the body is adapted It is this need to increase pressure and flow of air which gives rise to difficulties in adaptation which may be best described under five headings Effects due to

(1) changes in pressure and volume,
(2) increased air density
(3) increased oxygen pressure,
(4) increased nitrogen pressure,
(5) decompression

(1) Pressure and Volume Changes

As far as the lungs are concerned so long as the pressure of the respiratory gas is kept the same as that of the surrounding tissues no harm will result An excess may force air into the pleura or lung capillaries, a lower pressure may result in a "squeeze" a situation in which a diver is crushed into his helmet by water pressure The importance of the former will be described by a subsequent speaker the latter is an unimportant rarity

Some idea of the extent of the volume changes may be appreciated by realizing that to descend as little as 33 ft in the sea doubles the pressure A man who dives without apparatus with his chest in full inspiration—perhaps containing 6 litres—will be in full expiration with 11 litres (the residual volume) if he swims down to 100 ft

Many other inconveniences, sometimes serious, may occur due to pressure changes of air in the middle ear or sinuses or gases in the alimentary tract or at the roots of carious teeth

(2) Increase in Air Density

As air pressure is increased so will its density become proportionately greater It is found in practice that the maximum breathing capacity of a diver is halved at 100 ft Thus resistance to breathing will be considerably increased with diving not only the individual's personal respiratory resistance, but also that of any apparatus he might be using A breathing set with an acceptable resistance at the surface may be quite unsuitable for use at depth Careful attention must be paid to the effect of density when designing underwater breathing apparatus and assessing man's underwater efficiency Many

inexperienced divers have been alarmed by the increased respiratory effort required for even moderate work

(3) Increased Oxygen Pressure

When pure oxygen is breathed at atmospheric pressure certain changes occur Because more oxygen is in solution in the blood this will be used first by the tissues so that there will be less reduction of oxyhaemoglobin This lessens the efficiency of the blood in removing carbon dioxide from tissues Changes in intracellular metabolism are believed to result from excess oxygen affecting enzyme systems, e g the inhibition of enzymes with the sulph-hydryl group and a depression of the acetylization of choline (Haugaard 1955) Whatever the biochemistry a significant effect in man is a considerable reduction in the cerebral blood flow—a reduction which is not met by the excess oxygen carried This results in a lowering of the syncope threshold (Miles, 1957) In practice it is found that swimmers breathing oxygen, even at relatively shallow depths, may lose consciousness as a result of the summation of this reduced syncope threshold with other syncope promoting factors such as anxiety, hyperventilation, increased intrapulmonary pressure alcoholic hangover, hunger and ill-health This is the underlying mechanism of a condition which has been called in the diving world 'Shallow Water Blackout" and which has a parallel in the "aero-syncope" of aviation medicine The term "oxygen syncope" has been suggested to describe the condition in divers and because of this risk which is greater in inexperienced men the Navy is developing an air breathing set to replace the oxygen one for training and general use restricting the use of the closed circuit oxygen set to operational circumstances where it is essential that to limit detection no bubbles are produced

Furthermore, if pure oxygen is breathed at pressure more than twice that of the atmosphere, e g at depths of 33 ft. or more convulsions may occur, the classical sign of oxygen poisoning (Donald, 1947) The convulsions are epileptiform and may be preceded in some cases when a mouthpiece is used by lip twitching The convulsion is the manifestation of oxygen poisoning but it is reasonable to assume that before this dramatic event occurs some changes in the central nervous system must be taking place To find out what these changes are is a major requirement for the underwater physiologist. Is oxygen syncope a mild form of oxygen poisoning and is the final convulsion due to anoxia or retention of carbon dioxide? There is perhaps a clue to this in the "oxygen paradox" where giving oxygen to an individual who is nearly unconscious with anoxia may produce temporary loss of consciousness On the other hand oxygen syncope and oxygen convulsions may be compared with *petit mal* and *grand mal*

If a study of partial pressures is made it will be seen that breathing air at a depth of 280 ft produces the same oxygen pressure as pure oxygen at 33 ft Thus at this depth or deeper there would be a risk of oxygen poisoning

whilst breathing air, a fact which would in itself make it dangerous to use air for diving at such depths

Much more work is needed before the mechanism of oxygen poisoning is understood but recent work has shown a similarity between oxygen poisoning and X-irradiation in that both produce in the tissues, oxidizing free radicals In clinical practice high pressure oxygen is used to increase the effectiveness of irradiation in the treatment of cancer

Oxygen too has a chronic effect Animals breathing pure oxygen at atmospheric pressure may die in about ten days from pulmonary œdema and pneumonia and infants breathing oxygen for prolonged periods have developed a retro lenticular degeneration

(4) Increased Nitrogen Pressure

When air under pressure is breathed the partial pressure of its nitrogen will be correspondingly greater and when excess nitrogen diffuses into the tissues it produces a narcotic effect which at a depth of 200 ft. may render an individual incapable of accurate thought and action With training however an experienced diver may do useful work at 300 ft A similar condition may be produced by breathing 20 per cent nitrous oxide at the surface The effect of nitrogen can be shown to abolish alpha-rhythm blocking in the EEG record and vary the threshold of fusion of a flickering light It becomes apparent that though gross effects are rarely seen at depths less than 150 ft changes are taking place even at shallower depths There is some evidence that even at atmospheric pressure the ambient nitrogen has some blanketing effect on the C N S, for its removal by breathing oxygen or oxy-helium mixtures or reducing nitrogen pressure by altitude does in many cases produce exhilaration and increased acuity This is at present largely speculation but it is an interesting conception that nitrogen, far from being an inert gas may play a part in damping C N S activity Further work is being planned on this rather unusual idea of the "nitrogen blanket"

(5) Decompression

Having established that a diver may breathe air with comparative safety down to a depth of 300 ft this is not the end of the story At the increased pressures both oxygen and nitrogen will dissolve in excess in the blood The oxygen will be metabolized but the nitrogen will diffuse from the blood into the tissues The important point is that the excess gas passes into the body through the lung alveoli during the pressure increase If pressure is suddenly released the change will be felt throughout the tissues and if the drop in pressure is great enough bubbles will form in both blood and tissues producing what is called "Decompression Sickness" The symptoms of this may be rashes, itching, painful joints (bends), pulmonary irritation or cerebrospinal involvement according to the degree of bubble formation Fat cells may be ruptured producing lipemia and cases have been reported in obese men of fat emboli passing through a patent foramen ovale to lodge in the brain.

Decompression sickness is by no means confined to divers It occurs quite commonly in men working under pressure in the construction of under-water tunnels and is a well-known hazard for airmen subject to explosive decompression

The only way in which the condition may be avoided is to ensure that the decompression is so slow that the excess nitrogen can be given off from the lungs before bubbles form Though ideally a diver would be brought up to the surface very gradually it is convenient and effective to bring him up in steps of 10 ft allowing him to rest appropriately at the various stages

The adverse effects of density, oxygen, nitrogen and decompression sickness which have been outlined have not prevented a diver reaching a depth of 600 ft and perhaps the most interesting way of showing how the difficulties may be overcome would be to describe how in 1956 Lieutenant Wookey, a naval diver, established the worlds record dive of 600 ft off Norway At this depth he was able to do useful work for five minutes Had he been breathing air narcosis would have rendered him unconscious If this could be prevented oxygen poisoning could still occur and even if this too could be prevented the increased air density would make breathing very difficult and work impossible The dangers of long decompression still remained What then was done?

Briefly, the diver descended to 40 ft breathing air Here the air was replaced by a mixture of 8 per cent oxygen in helium At this depth it will be found that 8 per cent oxygen exerts the same partial pressure as 21 per cent oxygen (e g air) at the surface Also 8 per cent oxygen at 600 ft has a partial pressure less than threshold for oxygen poisoning Thus the risk of oxygen poisoning is removed At the same time helium has not the narcotic properties of nitrogen and can be breathed with safety at this depth Finally because the atomic weight of helium is much less than that of nitrogen the resultant mixture has at 600 ft only half the density of air and thus offers a resistance to breathing which is acceptable

With this mixture Lieutenant Wookey was able to reach the bottom in about five minutes and complete his allotted task chosen to simulate the work a diver might do to secure a rescue bell to a sunken submarine

Although this simple breathing mixture took the diver safely to the bottom the problem of decompression still remained for helium would dissolve in blood and tissues in a manner similar to nitrogen This had been calculated to require about seven and a half hours of decompression a time which in cold Norwegian waters was more than any man could tolerate

The pressure changes in water are such that as the diver gets deeper, a much greater distance up or down can be undertaken than when he is nearer the surface for the same relative change in pressure For this reason an ascending diver can come about two-thirds of the depth before stopping and thereafter coming up in 10 ft stages he must have increasingly longer stops

It was therefore possible to bring Wookey up to 200 ft in a very short time At this depth he was met by a submersible decompression chamber,

a form of diving bell, filled with air at a pressure equivalent to the depth. This the diver could enter to find a companion waiting to remove his helmet, give him a hot drink and encouragement. Maintaining the pressure within equivalent to 200 ft the chamber was hoisted in board the attendant vessel and the tedious process of decompression completed in security and with a tolerable degree of comfort.

It is likely to be a long time before a further attempt on this record is made as research is being directed from deep diving to the self-contained free swimming diver who must take his atmosphere with him in bottles. He has a much greater mobility and freedom and although he cannot at present do much below 200 ft this is sufficient for most general needs. Physiologically the problem will be very much the same but there is one striking difference. The standard diver is fully controlled both in ascent and descent by a team of attendants on the surface. The free diver on the other hand, as the depth and endurance of his breathing apparatus increases is himself responsible for controlling his depth, timing his duration and working out his decompression. The vital question is whether he can do this safely under the influence of even minor degrees of nitrogen narcosis. This we have yet to find out and for this reason we must learn more about nitrogen narcosis how it may be avoided or controlled.

Time does not allow mention of the many other interesting aspects of underwater medicine. My two colleagues will be presenting subjects of exceptional practical application about which they are both well qualified to speak.

Even so there is much work which we must leave, problems of apparatus design, underwater propulsion, blast, vision, sound and detection. There is also much for us to learn from the behaviour and anatomy of seals and whales and if this summer the much advertised television search for the Loch Ness Monster is successful who knows what secrets may be revealed!

ACKNOWLEDGMENT

I am grateful to the Medical Director General of the Navy and the Director of Naval Medical Studies for permission to publish this article.

REFERENCES

DONALD, K. (1947) Oxygen Poisoning. *Brit. med. J.* **1**, 667.
EDHOLM, J. H. (1958) *Proc. Roy. Soc. Med.* **51**, 63.
HAUGAARD, N. (1955) Effect of High Oxygen Tensions on Enzymes. U.S. National Research Council Publication 377.
MILES, S. (1957) Oxygen Syncope. M.R.C. Report 57/880.

ESCAPE FROM SUBMERGED AIRCRAFT[1]

BY

Surgeon Lieutenant-Commander J. S. P. RAWLINS, R.N.

ONE of the hazards of operating aircraft from ships is the liability of the aircraft to take a sudden plunge into the sea with little or no warning from an altitude which renders escape by parachute out of the question.

Fortunately, in the past, aircraft have tended to float for a considerable period which has afforded the crew a fair chance of effecting an escape. But the advent of the jet-plane has considerably reduced this tendency for the engines being not only exceedingly heavy but basically little more than highly-specialized drain pipes offer little or no obstruction to the process of flooding-up, and the only structures providing temporary buoyancy are those few compartments of the wings and fuselage which are not occupied by mechanical and electric equipment, and the pilot's cabin.

When the present generation of naval aircraft was visualized the situation was observed to deteriorate further for their design necessitated taking-off and landing with the pilot's canopy locked and their weight exceeded 15 tons—about double the weight of a London bus—and if you can visualize the problem of escaping from a London bus dropped into the sea from a height of 50 ft. you will readily appreciate that aircrew were becoming a little apprehensive about the possible outcome of a ditching!

In June, 1954, the matter was discussed at the Ministry of Supply and at the same time a survey was made of the lethality of recent ditching incidents. The latter revealed that 30 per cent. of aircrew involved in any form of ditching failed to escape, and there appeared to be no record of a successful escape from aircraft which had entered the water in the inverted attitude. It was concluded that a practical investigation of the problems involved in abandoning a submerged aircraft was an urgent requirement.

Subsequently, various proposals for facilitating escape were put forward ranging from the siting of explosive charges to cut away part of the fuselage enclosing the cockpit, to the provision of large floodvalves which would allow water rapidly to enter the cockpit and thus prevent the creation of a large differential pressure between the air trapped within it and the water surrounding the sinking aircraft. The Institute of Aviation Medicine

[1]A paper read before the United Services Section of the Royal Society of Medicine on the 5th June, 1958.

favoured the use of the ejection-seat which if it could be made to function under water would carry the pilot clear of the wreckage and subsequently release him automatically from his seat harness and allow him to swim unimpeded to the surface

It was appreciated at that stage that the problems involved in such a procedure would be as follows

(1) The effect of the shock-wave from the ejection-gun cartridge (which contained up to 2 300 gr of cordite and was capable of catapulting a 150 lb man and an 80 lb seat 80 ft into the air)
(2) The effect of the drag engendered by driving seat and man through the water at higher accelerations and higher velocities than had ever voluntarily been experienced before
(3) The effect on the lungs of the rapid expansion of their contained air when a man was shot from a greater to a lesser depth

Various acknowledged authorities were consulted and at a meeting on 12th October, 1954, it was concluded that escape by this method was not feasible On the following morning news was received that Lt Bruce McFarlane, Royal Navy, had successfully escaped from a Wyvern aircraft by ejecting himself underwater

It was almost two years before an opportunity arose of starting practical work on the project Tests had been ordered on the underwater-jettisoning characteristics of the pilots and observers canopies in Vixen aircraft, and it was arranged to carry out some live escapes during this trial Part of the fuselage of the aircraft, containing both pilots' and observers' compartments was mounted in a steel frame with 7,000 lb of ballast and so arranged that it could be lowered into a 40 ft deep tank A number of preliminary runs were made to ascertain whether the build up of pressure would be so great as to cause the walls of the cockpit to implode, and when it was apparent that this was not going to happen a team comprising a doctor and three divers took it in turns to descend in the fuselage to various depths and try to jettison the canopies and escape All wore conventional Frogmen-type gear and usually one occupied each compartment while the other pair remained in the water as a stand-by team to extricate the subjects should the fuselage collapse or the inrush of water when the canopies were jettisoned dislodge their breathing apparatus Tests were made in both the normal and inverted attitudes

The impression created by the first test was unforgettable As the fuselage sank water poured into the cockpit through heating and pressurization-ducts and various other orifices When the cockpit was about half-full the canopy jettison system was operated Explosive jacks blew off the canopy with a loud bang and water poured in from all angles buffeting the subject's head to and fro and threatening to knock off his face-piece Suddenly it was all over and there was complete silence and the subject was able to release his harness and float to the surface

The conclusion drawn from these trials was that the chances of escape

from Vixen aircraft submerged in the normal attitude were good provided that the rate of flooding-up of the cockpit was sufficiently large in relation to the rate of sink to prevent the canopy being held in place by the creation of a large cock-pit/water differential pressure but the chances of escape from an aircraft in the inverted attitude, where the pilot's head would be submerged first during the process of flooding-up, were frankly remote

Accordingly investigation of the possibility of using the ejection-seat underwater was strongly recommended

The next phase was begun in February of the following year by firing a seat with a dummy pilot from an iron frame bolted to the floor of a tank at the Royal Aircraft Establishment, Farnborough Records were taken of the acceleration of the seat and of the velocities achieved, and the parameters of the shock wave generated by the explosion of the ejection-cartridge were determined from recordings obtained by crystal pressure gauges located 18 in from the point of separation of the two parts of the ejection gun and at the wall of the tank

The maximum figures thus obtained with various types of ejection gun were as follows

(1) Velocity—34 ft /sec
(2) Acceleration—5 g
(3) Blast pressure—26 p s.i
(4) Height of rise of seat—17 ft

The question of velocity was tackled first. A metal trapeze was constructed which was attached by a wire to a streamlined float A second wire connected this via a single sheave to a 2 4 litre Jaguar car The subject clung to the trapeze, which rested on the bottom of a 30 ft deep lake and having made a maximum expiration to lessen the dangers of lung damage during his ride toward the surface signalled that he was ready to go The Jaguar then accelerated along the lake-side from a racing start pulling the trapeze up from the bottom at a shallow angle and then horizontally at a depth of 10 ft across the lake A maximum speed of 44 ft /sec was achieved in this manner with no damage to the subject other than some residual stiffness

On the effects of high accelerations underwater no information was forthcoming It was suggested that acceleration—as opposed to velocity—might have a profound effect upon the drag because it was known that in order to initiate movement in an immersed body much energy was required to start the water flowing but all the experience of the hydro-dynamicists related to the behaviour of spherical or ellipsoidal bodies and no forecast could be made which would apply to a pilot and ejection seat

It was decided therefore to tackle the remaining questions together by carrying out actual ejections with live subjects but with reduced charges

The first of these, with 350 gr of cordite took place in the tank at Farnborough during May The subject, wearing breathing apparatus, was strapped into the seat at the bottom of the tank A second diver stood by as the tank was filled up As before the subject made a maximum expiration

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and then signalled that he was ready Five seconds later the seat was fired by remote control from the surface The test although a somewhat exhilarating experience was entirely successful

A few days later a second shot with 750 gr of cordite was made and this time both subject and attendant were considerably shaken by the force of the explosion which was enhanced by reflected waves from the walls of the tank

It was decided that the possibility of injury with the next (1,500 gr) charge could not be excluded and the project was therefore transferred to another tank which was much larger and in which full photographic records could be obtained by means of high-speed cameras

Further tests with dummies had to be carried out to determine the characteristics of the shock-wave in the larger tank and to check the integrity of the tank walls, for one side was entirely constructed of glass and the pressure on the lowest panes was of the order of 10 000 lb —comparable to the thrust of a modern jet-engine at full throttle, and the effect of a broken window on personnel both inside and outside the tank can be imagined

In point of fact in each test one person only was allowed within the danger area outside the window—the officer responsible for directing the operation on whom the safety of the divers depended all the cameras and recording equipment were operated by remote control and the operators being linked to the controlling officer by means of an intercommunication system

A foolproof system of controlling the divers and technical sections was devised and practised with due allowance for misfires and other eventualities and in the absence of an emergency recompression chamber all subjects were required to breathe out and to be seen to breathe-out before the signal to fire was given

By the end of July, five months after the first dummy tests at Farnborough, a live shot with the full ejection-seat-charge had been successfully completed and since then a total of 13 live shots with four subjects has been accomplished

In addition dummies have been fired through the Perspex canopies of submerged fuselages to assess the risk of damage from striking the canopy and the possibility of eliminating the shortcomings of the present ejection system by modifying the gun for use with compressed-air has been investigated

The conclusions drawn from these experiments are as follows

(1) When the canopy is open or off escape from a submerged aircraft can best be made by climbing out inflating the survival waistcoat and ascending to the surface breathing-out all the way
(2) When the canopy is locked in position it is better to employ the ejection seat firing it through the canopy if the latter is of frangible plastic or if it is reinforced waiting for the cockpit to flood up before jettisoning the canopy and then firing the seat
(3) In all cases it is necessary to safeguard the lungs against the change in pressure by breathing-out prior to firing, and also on the way to the surface after the seat-harness has been automatically released

Recommendations have been put forward for modification of all ejection-guns, to ensure their proper functioning under water and the need for further investigation into the development of an auxiliary system for operating the ejection seat in aircraft with infrangible canopies has been stressed

Fleet Orders, based on these conclusions and recommendations are being promulgated and it is hoped to establish a training programme in the near future

It remains to be seen whether the present mortality of 30 per cent. from ditching accidents can be reduced

ACKNOWLEDGMENT

I am grateful to the Medical Director-General of the Navy and the Director of Naval Medical Studies for permission to publish this article

SUBMARINE ESCAPE[1]

BY

Surgeon Lieutenant R J W LAMBERT, R N

DURING the last half-century, many methods have been devised, by which the crew can escape from a submarine should it fail to surface The requirements of any method of submarine escape are firstly, that it shall be simple enough to be understood by, and gain the confidence of the least intelligent member of the ship's company, secondly that it shall be independent of help from surface vessels or other outside aid and, lastly, that the apparatus involved shall not be so bulky as to affect adversely the essentially offensive role of the submarine as a weapon or render it more vulnerable to enemy action or the normal hazards of its underwater environment

Methods which have failed to satisfy these criteria include various types of salvage, and the Rescue Bell The latter is a diving chamber which is lowered on to the deck of the sunken submarine from a vessel moored on the surface so as to make a watertight seal over one of the hatches, enabling the submarine crew to be transferred in batches to the surface without their being subjected to increased pressure Although it was dramatically successful in rescuing the crew of the U S Submarine *Squalus* in May, 1939, the odds against a vessel carrying this being in the vicinity of the sunken submarine, and being able to moor with sufficient accuracy in the face of possibly adverse surface conditions quickly enough to rescue the crew before they succumb to the atmospheric conditions in their submarine are so great, that it has recently been dropped altogether by the Admiralty as a practical method of saving life from sunken submarines

This has confined the subject of escape to methods which can be operated solely from within the submarine and these all have the disadvantage of subjecting the escapees to increases of pressure and the physiological hazards that go with them, during their escape, in addition to the obvious psychological stress of such a situation The existing methods are compartment escape as the primary one and tower or chamber escape as the secondary ones Compartment escape consists of a compartment at either end of the submarine, equipped with hatches from which a length of twill trunking can be lowered to within a few feet of the deck The compartment is then sealed

[1]A paper read before the United Services Section of the Royal Society of Medicine on the 5th June 1958

off from the other parts of the submarine by watertight doors and flooded. As the water rises the air in the compartment is compressed until the point is reached at which the pressure within is equal to that outside the hatch and this can then be opened. The trunking fills with water, at the same time preventing the residual pocket of air from escaping. The crew stand with their heads above the water and in turn duck inside the trunking and climb out through the hatch.

In tower escape, the survivors leave in pairs by means of a specially fitted conning tower, or gun tower, or a specially constructed chamber built into the hull of the submarine which is flooded up until the pressure is equalized. The pocket of air is then vented through a valve into the sea and the hatch opened. After each pair has left the hatch can be closed and the chamber drained by remote control from within the submarine, ready for the next escape.

If the submarine has been submerged for any length of time before the escape commences the atmosphere within it may contain up to about 5 per cent carbon dioxide, so that during flooding, as the pressure rises the partial pressure of CO_2 may well rise to toxic levels. To solve this in the past oxygen was breathed during the flooding and the ascent. The apparatus from which this was breathed—in the case of the Royal Navy the Davis Escape apparatus, in the American Navy the Momsen lung, in the German navy the Draeger—served both as an underwater breathing set, and as a source of buoyancy to bring the escapee to the surface. During the 1939–45 war the hazards of acute oxygen poisoning became increasingly recognized, and in April 1946 an Admiralty Committee under the Chairmanship of Rear-Admiral P Ruck-Keene, *C B E D S O* was set up to consider existing methods of escape and to make recommendations for the future. This committee found that a surprising number of men escaping from submarines of all nationalities during and before the war had reached the surface without any kind of breathing apparatus. It also found that many men who had sets used them incorrectly due to the stress of the situation and lost their lives, and that many more who used them correctly succumbed to oxygen poisoning. As a result of this committee's recommendations the method now known as free ascent ultimately came to be adopted by the Navy.

Free Ascent

This method depends essentially upon a man filling his lungs at a pressure equivalent to the depth of water, before leaving the submarine and exhaling continuously throughout his ascent as the pressure on his chest decreases and his lungs therefore expand. Since the partial pressure of oxygen in his original lungful of air is high, this will be adequate to fulfil his needs provided his ascent is not unduly prolonged. Similarly provided his ascent is not unduly prolonged he will eliminate sufficient CO_2 in his exhaled air to keep his alveolar partial pressure of CO_2 within tolerable limits. As a result of experiments carried out in the Royal Naval Physiological Laboratory,

reported by Taylor (1953), a suitable rate of ascent was found to be about 5 7 ft per second At this rate it can be shown that, for an average man making an ascent, rather more than two-thirds of the CO_2 he produces is eliminated in his exhaled air so that the increase in his alveolar CO_2 partial pressure is well within tolerable limits from depths as great as 300 ft This rate is achieved by the escapee wearing a 14-litre capacity bag as a stole over his submarine escape immersion suit, filling it first at a pressure equivalent to his depth A valve on it that lifts at ¼ lb per sq in keeps its volume and therefore his rate of ascent fairly constant on the way up With the abolition of oxygen breathing sets the problem of CO_2 partial pressure during the flooding up stage has been solved by the construction within the escape compartments of what is known as the Built in Breathing System By means of this, air or any suitable mixture of oxygen and nitrogen is delivered through a special system of valves so as to reach the escapee at ambient pressure throughout flooding up At present the gas supplied in this is a 40/60 oxygen/nitrogen mixture The reason for this is to reduce the risk of nitrogen narcosis interfering with a man's drill before he leaves the submarine, and that of a subsequent bend occurring after he reaches the surface, by reducing the nitrogen content so far as this is possible without the percentage of oxygen being so high as to produce a serious risk of oxygen convulsions Breathing a 40/60 mixture at 298 ft (10 atmospheres absolute) is equivalent, from the point of view of oxygen poisoning, to breathing pure oxygen at 99 ft (4 atmospheres absolute) It is true that at this depth if the mixture is breathed for more than a few minutes its oxygen content does become a hazard but at 298 ft so many other factors are present to lessen the chances of a successful escape, that the added risk of oxygen poisoning is a relatively small one, and while a change to compressed air would virtually abolish all risk of oxygen poisoning it would slightly increase the hazard of nitrogen narcosis and bends at the lesser depths where there is a much greater chance of a high percentage of lives being saved

Pulmonary Barotrauma

The main risk of the ascent to the surface is that of pulmonary barotrauma, which can sometimes result in traumatic air embolism The former is caused by an increase in the intrapulmonary pressure throughout, or in a part of the lungs which stretches and tears the alveoli forcing air into the interstitial tissues, and, in more severe cases rupturing pulmonary vessels so that air is sucked into them and this enters the systemic circulation This condition was first described by Adams and Pollak (1932) following a death occuring in American submarine escape training It is not confined to free ascent and indeed, the death they reported occurred in the case of a man wearing the Momsen lung, but it is probably a more prominent risk in free ascent than in ascents with breathing sets or in diving operations generally

Since the adoption of Free Ascent with Buoyancy by the Navy in 1954, practical training in it for all submariners has been carried out in the sub-

marine escape training tank at H M S *Dolphin* Up to date approximately 6 900 men have passed through this course and as the practical part of it consists of one free ascent without buoyancy from 15 ft, and two ascents from 30 ft., one from 60 ft and one from 100 ft all with buoyancy, over 34 000 escapes have been made Of this number a tiny, but significant, proportion of casualties has occurred The number to date is 12 an incidence of only slightly more than one in 3.000 Of these 10 have had symptoms primarily of cerebral air embolism the other two have shown a clinical picture of widespread damage in the thorax without associated neurological symptoms In no case has the condition been fatal However the organization of the Submarine Escape Training Tank makes provision for these cases and has an efficient drill for rapid recompression

The manifestations of air embolism have been varied as would be expected, including cases complaining of vertigo with tingling in one or more limbs both spastic and flaccid pareses, transient interference with vision—in one case the loss of the left field in another, central scotoma—and in two cases repeated epileptiform convulsions In the treatment of all these cases it is essential to recompress with the minimum delay and since recompression has usually quickly abolished all symptoms it has generally been impossible to get localizing signs for the lesion In at least four of these cases electroencephalography has afterwards confirmed the presence of some central nervous focus but usually this could not be done until twenty hours or more after the accident since therapeutic recompression takes at least nineteen hours Of the two cases without signs of air embolism, both had severe mediastinal emphysema spreading up into the neck and one of them in addition had a bilateral pneumothorax, and a pneumoperitoneum In only about half of these cases did the subject remember either pain or a feeling of overinflation in his chest on the way up and although in several of them the ascent was noticed to be a bad one in so far as the man was seen to breathe out either intermittently or rather less than average, in none of them was the ascent markedly worse in this respect than in very many others who arrive on the surface without symptoms Time does not allow me to go into the many interesting clinical points arising in these cases and in any case there is very much more to be learnt about the various sites of, and mode of action of, air emboli within the brain, but obviously one of the first questions is whether the damage occurs in a completely healthy pair of lungs or whether in fact there was some predisposing pulmonary anomaly In favour of the latter is the fact that more than one of these men ascending from 100 ft can recollect a sensation of running out of air somewhere around the 60 ft level If they were in fact down to residual air at this point it is obvious that the total expansion between there and the surface would be well within physiological limits In addition, before starting to make any ascent each man is held by the tank instructors until it has been ascertained that he is breathing out freely, so that in fact he has blown out an appreciable volume of air before he starts to rise In view of this, and the fact that all those who have subse-

quently become casualties have been seen to be blowing out at least most of the way up, it would seem to suggest that some predisposing cause in the lungs must be responsible. These men who are young healthy submariners have been clinically examined regularly, their medical histories have been gone into carefully and their chests have been recently X-rayed before they attempt the course, so one may exclude any gross chest pathology.

Possibilities put forward to explain the mechanism of the original damage have included:

(1) *Emphysematous bullæ* which might rupture at a lesser differential of pressure than it would take to damage the alveolus. This could explain one or two of the cases, but it is difficult to make it fit the facts of most of them.

(2) *A build-up of pressure* in one or more pockets of the lung. Here it is visualized that a partial blockage of a smaller air passage might, while allowing the pressure in the zone it supplied to equalize with the rest of the lung, during the flooding or compression stage, where the increase in pressure is relatively slow, nevertheless block the escape of air sufficiently, during the rapid decompression of the ascent, to allow a pressure build-up to occur, leading to alveolar rupture.

A gross case of this was thought to have occurred with a fatal result in the U.S. submarine escape training tank in New London in April 1957. A trainee arrived at the surface unconscious and died a few minutes later in the recompression chamber. At the post-mortem one bronchus was found to be partially blocked by a calcareous body, which was thought to be derived from a calcified gland, and having eroded through the bronchial wall and travelled along the bronchus to a point where it blocked it, to have formed in fact a "ball valve." Both the damage to his lungs and intracranial damage due to air dissection were extensive. While this pathology must be very rare indeed, it does seem possible that some similar mechanism in a milder form could be responsible for some of the cases encountered.

(3) *Compensatory Alveolar Emphysema*.—In a paper published in 1943, Macklin and Macklin suggested that several factors working together led to pulmonary interstitial emphysema.

Firstly they suggested that if in the past there had been an atelectasis of one small region in the lung, too small afterwards to show on X-ray, nevertheless it might cause sufficient compensatory emphysema in its immediate environment to produce a potential weakness. Secondly, they pointed out that the pulmonary blood vessels surrounding the alveoli acted as a buttress to their walls. In a normal inspiration, as the alveoli increase in size so also does the pulmonary blood flow and so the calibre of the pulmonary blood vessels. In other words, as the walls are stretched, so the buttressing effect is increased. In abrupt decompression, however, the pulmonary blood vessel calibre is decreased if the lungs become over-inflated, due to direct pressure on the heart and great vessels by the expanded lungs, and pressure on the pulmonary capillary bed, by the expanded alveoli. The combination of these two factors could again be a cause of alveolar rupture.

If one regards the alveolus as a square box with four sides surrounding its entrance and a base opposite, the four sides, or alveolar ring will be able to stretch to a greater degree than the base which will be the point of rupture Alveolar bases are thought to be of two types those which rest on connective tissue for instance the blood vessel sheaths, and those where the base is a partition simply between two adjacent alveoli In the first type if this connective tissue is part of the perivascular sheath following rupture the air will find its way to the hilum via this sheath and the bronchovascular rays, and so set up a mediastinal emphysema Having started to travel in this direction other respiratory movements will produce a pumping action to keep the flow going and it seems that a positive differential of pressure can be produced in the mediastinum In addition when the pressure within the alveoli is released the air in the interstitial planes will be at a positive pressure, so that, if blood vessels are torn by the air tracking along the perivascular sheaths air might be positively forced into them In the second type a minor rupture of the base which did not tear the blood vessels would produce no symptoms, for the air would simply pass into an adjacent alveolus, and indeed it has been suggested that there are "physiological pores" connecting adjacent alveoli A more severe rupture however, might tear the vessels within the base and the vein being collapsed at the time of tearing would be in a suitable state to suck air in subsequently, when a fall in intra-alveolar pressure permitted its re expansion, and so initiate an air embolism

These suggestions as to the cause and mechanism of pulmonary barotrauma admittedly leave many points open to criticism and very much more experimental work will be needed before it can be said how the damage does occur Nevertheless it is a subject of interest as well as one of practical importance, for if completely healthy lungs are being damaged during training, then somewhere possibly the drill is at fault and must be changed If however there is some predisposing anomaly of the lungs the problem becomes one of diagnosis and personnel selection and perhaps with the ever increasing diagnostic potentialities of radiography even these anomalies may be picked up on X-ray in the future

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References

Adams B H and Pollak L B (1932) Traumatic Air Embolism in Submarine Escape Training *U S Nav Med Bull* 30 165

Macklin C C and Macklin M A A (1943) Essays in Biology Univ of Calif Press

Taylor H J (1953) Recent Research in Submarine Escape, Admiralty Report U P S 137 R N F 53/778

THE CHRISTMAS ISLAND STORY

BY

Acting Surgeon Commander P D G PUGH, R N

PART III

Drop Number Two

By the 30th May the ships of the 'Grapple' Squadron had all assembled and the day was declared D-Day minus one H M S *Alert* embarked representatives of the British Press and Press Agencies who had flown up from "Christmas" to Malden Island that day

The weather on D-Day 31st May seemed rather less certain than that on the morning of the first drop, however the criteria for safety were fulfilled and the programme went ahead

As before we all assembled on the flight deck to witness the burst This time, however, there was considerably less tension, and some appeared almost blasé about the whole affair Some indication of what might be expected however, was given when we were warned not to remove our goggles on looking round to view the burst until such time as the all clear should be given

The two initial runs passed off without a hitch and we were then told that the third run would terminate with a "*live visual drop*" As the plane came over the ship the pilot announced that the target was now obscured but that he anticipated that it would clear A few seconds later he stated that the target was now visual and shortly after that we heard that the weapon had left the aircraft A tense stillness followed, as everyone waited, poised and expectant The time 1041 As "*zero*" was reached in the count down the now familiar wave of warmth struck the back of our necks At "*ten*" on the count up we turned round and here was a most tremendous spectacle Even with our goggles on the heavens were still brilliant And there was the fire-ball huge, terrible, surging and boiling with pent-up power forcing its way upwards and outwards at a truly fantastic speed For a second or two it closely resembled a giant vividly coloured sea-egg but as it shot upwards a shaggy stalk was sucked out from beneath it and rapidly coalesced with the cornet of cumulus cloud formed below by the inrush of cool air And now the whole appearance more closely resembled that of a mushroom than could be imagined possible For in addition to a perfect mushroom-shaped head we now beheld a typical stalk, ragged throughout its upper third, which had

been formed by the true cloud, and smooth throughout its lower two-thirds which had been formed by cumulus cloud. The base of the stalk merged with low cloud which obscured the skyline. Within the rim of the mushroom, brilliant purples and oranges commingled without in any way clashing, so that one might be excused for describing the whole appearance as being extraordinarily beautiful. Everything was vaster and faster than in the previous "drop", and it did not take an expert to realize that we were witnessing one of the biggest explosions ever to occur. Soon the familiar peach colour appeared within the substance of the mushroom and the stalk began to heel over. Curiously enough the noise was even less than in the first explosion, although the effect on the ear drums more marked. The high level of detonation and the direction of the wind have a profound influence on these matters.

The Press had been invited aboard for gin, lunch and a walk around the ship. The sea was still quite choppy and they received a thorough drenching as they were brought across from *Alert* in our motor cutter. It was fun to meet some of those whose articles are so well known. Cassandra himself, soaked to the skin but still very much like his profile in the *Daily Mirror*. As is well known he has as big a loathing for beards as he has for the H-Bomb and his final words to me were that he would fight for a new Bill under the *Hirsute Practices Act* to rid me of mine. However as he wrote later, we parted without "crossing razor blades". Among other well-known journalists was Mr. Chapman Pincher of the *Daily Express*. For him the Sick Bay performed a special drying and pressing service so that he left *Warrior* as smartly attired as he had left *Alert*.

We sailed for "Christmas" on the evening of the first of June. It was planned for *Warrior* and *Narvik* to spend a few days at Penrhyn and for *Pukaki* and *Rotoiti* to go to Papeete. Meanwhile *Alert* bade us farewell and sailed for Singapore flying her paying-off pennant.

Penrhyn Again

We sailed for Penrhyn on 9th June, stopping briefly at Malden on the 10th to refuel *Narvik* who had just returned from Penrhyn.

Our arrival at Penrhyn on the 12th caused a minor sensation to the population who had of course seen neither a carrier nor a helicopter before.

They came out by the dozen the first day and by the hundred the next, and gazed wide-eyed at everything there was to be seen.

That evening we held a concert party onboard—one of the acts was provided from ashore—a demonstration by the Hula group. Needless to say the whole ship rocked and rolled with applause as the girls got into action. Dressed in their native skirts they certainly "swung it". Our guests from ashore who were in the audience seemed to get even more excited than we were—and one Andrew Marsters (who had lived in Penrhyn for many years), a grandson of the fabulous William, eventually found he could stand it no longer. Seizing an "old crow," he rushed up on to the stage and leapt into the fray.

The Hula girls quite taken aback disappeared—and the audience found themselves with this game but antique pair. However, they gave them a rousing cheer—but this unfortunately was the last we saw of the Hula girls that night.

There are those days which one will always remember—the 13th of June was just such a day for me. I have referred already to the tiny hospital ashore—and the assistant medical practitioner—Dr John Koekoe, a Rarotongan trained in Fiji—who lives with his charming Fijian wife and baby son in a small house behind the hospital.

The doctor and his wife had been aboard for the concert and he had kindly invited three of us to go 'pearling' with him next day.

The day was perfect—there being little disturbance to the surface of the lagoon and yet sufficient breeze to carry our boat along at a reasonable speed. The helmsman was very friendly and assured us that we would come back with plenty of pearls. To add weight to his argument, he produced a little box and let us choose one each. The value of a pearl lies of course in its colour, shape and matching qualities. The pearls here are mostly of the golden variety, although some are white, some green, and very occasionally so deep a purple as to be almost black. A perfect white pearl, we were told, cannot be seen when immersed in a glass of water. Between World War I and the Spanish Civil War the island did a thriving trade in the golden pearl—for whereas in England such a pearl is virtually valueless—in Spain it is the golden pearl that is held in esteem. The Civil War, however, killed the trade, and it has never recovered. Nowadays it is the pearl shell that provides the natives with their livelihood. The small oysters in which pearls are found lie on the nigger heads in only a few feet of water, but the large oysters which provide the pearl shell lie in 10–20 fathoms or even deeper. The natives can dive to 18 or 20 fathoms wearing nothing more than a pair of goggles. They descend with a lead weight to which is attached a line which leads to the surface. The surface end of the line is attached to a log. Diving to this depth is a hazardous business and fraught with danger. Only a few of the natives do it. On reaching the bottom, the diver gathers what shell he can in one minute and then ascends. On reaching the surface he rests for a full ten minutes. Although these time restrictions have to be imposed, it is possible for a skilful diver to collect as much as two fair-sized sackfuls of pearl shell in a day—which, at four shillings and sixpence per pound, explains why these islanders now lead such a carefree life—a life so idle that they don't have to bother to catch fish to eat but can afford and prefer to live out of tins.

We reached the centre of the lagoon in a little under an hour. We anchored to a coral head which lay about 18 in. below the surface and which was about 75 yards in circumference. Now the sails were lowered, following which the mainsail was re-hoisted so as to lie horizontally and about 3 ft. above the vessel—thus providing a perfect verandah. This is something I have never seen before, and something which proved extraordinarily effective. We were just about to quench our thirst and tuck in to our sandwiches when the doctor drew our attention to the fact that it was a custom to hold prayers prior to a

diving expedition and the helmsman now recited a long prayer as we sat in silence.

After the meal we slipped on our goggles and each carrying a sack and wearing gloves and gym shoes clambered over the side and submerged.

The world we now beheld was almost too fantastic to describe. All around the edge of the coral head fell sharply away into a deep chasm—the bottom of which could not be seen. With one foot on the coral and the other out in space it looked and felt as if one must tumble into the unseen depths. Fishes of all sizes, shapes and colours could be seen swimming along at different levels. There were tiny blue ones—a brilliant, unbelievably vivid blue—which would collect around a spray of coral, and as soon as your hand approached disappear like lightning within the fronds. I saw two or three quite large white sharks but I was assured that they never approach the coral itself. Thousands of oysters varying in depth from a few inches to two fathoms lay around—it was merely a matter of picking them up and thrusting them into the sack. Our helmsman actually showed us an oyster still open with a pearl plainly visible within, about a fathom down. He then plucked it from its bed and returning to the boat opened it and produced the pearl to prove to those who could not believe their eyes that they had actually seen a pearl within an oyster—*underwater*.

When our sacks were full we returned aboard and then began the hard job of cracking open the oysters with a knife and finding the pearls. There is no way of telling which oyster will hold the pearl(s). It may be large, small, thin or thick, it may be first out of the sack, or the last—therein lies the fascination. I should guess we found about one pearl in every hundred oysters but we opened several hundred before we found our first pearl. Altogether we found about seven pearls before we re-entered the water to refill our sacks.

The sacks filled, we set sail for home. That night on the quarter deck the officers clustered around the sacks and had the thrill of a possible pearl plus a delightful oyster—they found no pearls. Next day however, we opened the rest. Although still alive it was now quite easy to prize them open and quickly divide the muscle that draws the two halves of the shell together. About fifteen further pearls were found, several being quite fine ones.

That evening we had the second showing of the concert party. This time the Hula group came in force with men and drums and tin cans and whistles. The audience yelled with delight, the girls swung their hips as they had *never* swung them before, the men beat the drums and danced to the rhythm with lightning speed. The Commodore's Secretary lost complete control of himself and donning a grass skirt leapt up and waggled himself dizzy. It was a great evening which neither Penrhyn nor *Warrior* will forget.

Next day the Island Council gave a luncheon party to fifty of the officers and men. We sat down at a long table covered with woven palm leaves—there was sucking pig, chicken, raw fish in coconut juice (delicious), yams, breadfruit and other delicacies. We were served by the Hula girls who then

danced beside us working themselves into a frenzy, as the local band warmed up. It was 'hep' in a big way. But now it was time for our sad farewell and after speeches by the Commodore and Charlie the local constable, we walked from the dining hall to the jetty and boarded the L C M that would take us back to the ship. Pearl the prettiest of them all, came with us, but only as far as the ship. We had been backloading stores from Penrhyn, and we wanted to 'backload' her—but had to resist the temptation! We sailed at 1400.

The Third Drop

We reached Malden p m 15th June. 18th June was declared D-Day minus one. On D-Day, as before, the various ships of the squadron took up their positions early in the morning. H M S *Salvictor* whose crew had not hitherto witnessed a burst, was the only newcomer to the scene.

By 1000, when lower deck was cleared for witnessing the burst, the sky was nearly devoid of cloud, and the day appeared perfect. The vapour trails of the two Valiants could be seen approaching from the north. As before, the aircraft passed three times directly overhead before the weapon was finally released. The time was 1040. The wave of warmth at the time of detonation, perceptible on the back of the neck, was on this occasion more marked and more prolonged than before. When 'ten' was reached on the count-up, the flash was fading fast and the fireball appeared slightly smaller than for the second burst. Around the fireball we could clearly see a halo of cumulus (*Wilson Cloud*), a phenomenon we had not hitherto observed. This disappeared in a matter of seconds.

Now the fireball began to surge upwards, and as it died smoke belched from it, and it assumed the shape of a 'vitallium cup'—grey overall, with a bright yellow band at its base, somehow more dramatic, yet far less colourful than before. Then a white cap appeared at the vertex of the cup and poured downwards as when icing is applied to a cake, until eventually the familiar mushroom head was formed. Meanwhile the upward surge had caused a well-defined cone to be left behind, pale grey in colour its apex embedded in the underside of the mushroom. Into this cone spiralled the cumulus cloud formed still farther below by condensation following the inrush of cool air into the vacuum. In this manner the stalk was formed, and about this time we heard a monumental crack far more in keeping with what we beheld than anything we had heard on previous occasions although the effect on the ear-drums was decidedly less. There followed a low, angry growl which persisted for at least half a minute and terminated in such a manner that it was difficult to decide when it had actually stopped. The scene at its climax was far more spectacular than anything we had seen before. The huge mushroom dome, white outside, pale peach within, was supported on a colossal stalk, the upper half of the stalk was shaggy, and the lower smooth. At the junction of the two halves appeared a billowing skirt. The bottom of the stalk was shorn off as with a gigantic knife, and wavering beneath this horizontal edge the

uppermost portion of a sandstorm stirred up on Malden Island—a memorable sight, well suited to terminate this historic operation For this indeed was the last "drop" and it had occurred one year after to the very day, the first members of 'Grapple," led by the then Deputy Task Force Commander (Commodore Gretton, *D S O* and two Bars, *O B E*, *D S C*) landed on the disused World War II airstrip at Christmas Island in a R A F Shackleton

On the afternoon of D-Day, the Commodore left *Warrior* on a ten-day trip to Fiji and New Zealand to express thanks for the help received

During the forenoon of D plus one, lower deck was cleared and the ship's company informed that it had now been decided that the Christmas Island Base was to be retained Thus the programme of back loading would have to be substantially modified

At 1340 on 20th June we sailed from Malden for the last time A few of us stood and watched from the flight deck as the lonely atoll disappeared beneath the horizon "Feeling sentimental?" I inquired of one ' If I never see it again, it will be too soon.' he replied I think many of us were inclined to think that way Everyone had toiled hard under extremely trying conditions—and the heat and humidity were beginning to make themselves felt Christmas Island was reached on the evening of the 21st

Strictly Medical

The weapons having been successfully detonated—I would like now to try and explode what I consider to be a couple of medical myths

Firstly, the question of salt—most of us sweat profusely in the tropics and we all lose water and salt but it has been shown conclusively that proportionately *more* water than salt is lost Ask someone in the Engine Room what happens when he sweats and ten to one he will tell you he loses salt Those entrancing (expensive) enteric-coated salt tablets in their luxurious bottles have blinded him to the fact that he loses water as well But continue your questioning—ask a dozen M (E)'s whether they take their salt tablets and as likely as not half will say 'of course I do, I take four or five every watch" and the other half will say 'never taken them in my life, what's the use of them anyway they don't do any good' I believe this latter group are right—I would go even farther, I think these tablets may even do positive harm. So indoctrinated has the modern sailor become to the importance of salt that he has forgotten the importance of water, and by consuming salt tablets like sweets as many do if they get the chance he runs a serious risk of throwing himself into further imbalance We had 8 cases of renal colic in a crew of about 900 in a period of four months, none of these people had had renal colic before Whilst I do not suggest that this proves anything, surely it may well be due to a chronic state of mild dehydration resulting from life in a hot ship together with insufficient fluid intake Conversely, we never saw a single patient whose disability could be explained on the basis of it being due to salt depletion Why should we? There is already additional salt added

to the diet. We saw a few, perhaps half a dozen, who had "flaked out" in the engine room but all these people required was a breath of fresh air and a few glasses of water. In my view they were straightforward cases of dehydration. The matter was put to the test aboard *Warrior*, for in the middle of May we ceased to issue salt tablets for a trial period—we never had to resume their issue. There was only one noticeable effect—some of the old timers muttered for a few days, but when it was explained to them that when you staggered across the Sahara and your tongue began to loll out it wasn't for a glass of salt, they began to see daylight. I agree that all I have said has been couched in unscientific terms, but I believe the time has come to review the position in the light of this experience which I understand has been shared by others.

The second myth I would like to explode is that a fan or a draught playing on one's naked abdomen causes an attack of the 'gripes'. I just don't believe this is so but if it is, what is the explanation? Now I am not the first to say this—even so I know a number of experienced colleagues may yet raise their eyebrows. During recent months I have lain night after night under these conditions in a temperature usually around 100° F. and never experienced any ill-effects. We have had our full share of diarrhœa. We had an outbreak of bacillary dysentery involving 40 persons, spread over a period of a fortnight, each patient quite ill for two to four days until chemotherapy took control. We had an outbreak of food poisoning, over 30 people laid out about two hours after lunch with vomiting, diarrhœa and prostration but all recovering equally rapidly. And we have had many sporadic cases of diarrhœa of uncertain origin—but in no single case could a draught or fan be blamed. I would go so far as to say it is an unimportant cause of diarrhœa in the tropics, if it were not for the fact that the older one grows the more one realizes that anything can occur—I would say it never causes diarrhœa.

I must draw attention to the horrors of Red Sea Rig. When are we going to throw out this unwholesome, unhygienic and outmoded garb? In an operation such as this it is impossible to arrange for the trousers to be cleaned—since the same trousers have to be worn week after week—modesty forbids me to describe in detail the filth and the sweat that coagulates on them; but the sad fact remains that the only reason we can go on wearing them is that they are black from the start. Even those made of tropical serge are unsuited to the tropics for they cannot safely pass through a ship's laundry. Moreover, the rig is hot, sweating is profuse and minor, if not major, skin disease is a direct result. And if there is a case for wearing sandals in daytime, why not in the evening when the temperature within a carrier is often higher? How sensible are our Fijian friends—Colonel Ganilau's evening rig consisted of a white shirt, Sula (a type of kilt) and sandals. I do not suggest that we should wear that rig but we can learn from those who live ashore in the tropics where it is always cooler than aboard, and surely introduce a rig which is light, cool and above all washable.

By and large, the health of the *Warrior's* ship's company and, in fact, the whole squadron, has been quite remarkable—rarely, apart from the two outbreaks of diarrhœa, have we had more than between two and five confined to bed. However during the final month of the operation there was a sudden increase of skin disease, mainly tinea corporis and tinea cruris. An attending list in the twenties rose to one of over a hundred. Fortunately no single case became uncontrollable, but I feel certain that the stage had been reached in which the sweat-sodden skin of these individuals could no longer resist the entry of the fungus. A remarkable number of patients with ringworm or furunculosis of the crutch blamed the wearing of pants (not only the jockey type but also the simple meshed underpants) for their disability. I now believe there is something in this. The sequence of events is as follows. The patient sweats profusely, his sodden scrotum either begins to itch (we had many cases of simple pruritus) or more often is "just uncomfortable." He then scratches or "adjusts himself" and in so doing drags the pants across his scrotum causing minor abrasions to the softened surface. The bacteria or fungus thus gain entry. A surprising number of persons told me that they had "cured themselves" by simply giving up wearing pants, a further argument in favour of a washable rig. Whilst on the subject of pruritus, we found the really intractable variety responded as if by magic to a small quantity of hydrocortisone cream kindly donated to us by the Tripler Army Hospital. Our routine for tinea consisted in the application of iodine for four days (for the majority but not all patients) followed by the application of Whitfield's ointment (emphasis being placed on the importance of massaging it well into the skin). We found this routine extraordinarily effective.

During the final month we saw numerous cases of prickly heat. For many of these we could do frankly nothing, but a surprising number responded to a combination of calamine or some similar soothing lotion, plus anti-histamine therapy.

We saw remarkably little epidermophytosis and even fewer cases of otitis externa. The majority of "tropical ulcers" responded to the routine of elastoplast treatment I outlined in my article on *Operation Hurricane*. Failure could almost invariably be attributed to fault in technique.

Of appendices we had five—the fifth patient had just time to see the third bomb before he was laid on the table[1]. The plastic covering produced by the *Nobecutane* Spray proved a first-class tropical dressing.

Our plan for dealing with radiation casualties had, of course, never to be put to the test. Whilst on the subject of the radiation hazard it is worth while pointing out that such subjects as decontamination of aircraft and personnel were entirely the province of the Defence Officer, although, of course, we worked in close liaison with him. Conversely, decontamination of sampling aircraft and personnel ashore were the responsibility of a medical officer trained by A W R E, namely Squadron Leader Sturrock.

Conclusion

On completion of "Operation Grapple," *Warrior* sailed for Pearl Harbour where repairs were made to her crumpled bows Then on to South America via Rarotonga and Pitcairn Island visiting many places of interest including Valparaiso Port Stanley Porto Belgrano, Buenos Aires Monte Video and Rio de Janeiro On completion of this cruise we returned to the United Kingdom on 11th October, 1957

APPENDIX

WHICH WAS WHICH IN THE GRAPPLE SHIPPING WORLD

ROYAL NAVY

H M S *Messina* (L S T)	Arrived at Christmas Island in August 1956 and acted as the *Headquarter Ship* for the Senior Naval Officer in the area She was used in general support of the landing operations She carried L.C M.s which were available for off loading stores and equipment from the supply ships She was fitted with additional evaporators which enabled her to make up to 100 tons of fresh water per day for consumption afloat and ashore and a large refrigerator in the tank deck for storing fresh and frozen provisions until they were required on the island
H M S *Salvictor* (Salvage Vessel)	Arrived at Christmas Island in October 1956 She was employed *laying mooring buoys* Also able to hoist in and carry a D U K W she was useful for ferrying and a host of general duties She was frequently used in the support of Jarvis Island
H M S *Warrior* (Light Fleet Carrier)	Arrived in March 1957 Acted as *Operational Control Ship* in the target area and wore the broad pennant of Commodore R N Hicks *D S O* (Commodore "Grapple" Squadron) Her radar kept track of all the aircraft in the vicinity especially the dropping aircraft. She also acted as weather reporting station Her aircraft carried out duties of search communications and air/sea rescue
H M S *Narvik* (L S T)	Arrived in March 1957 Operated as the *Technical Control and Monitor Ship* She remained often on her own near the target area throughout March July apart from a short break at Penrhyn She was specially equipped with air-conditioned scientific work rooms and photographic dark rooms and had a wooden helicopter deck
H M S *Alert* (Frigate)	Came from the Far East Station and was employed as *Observer Ship* for the first and second drops
H M S *Cook* (Survey Vessel)	On passage to commence surveying duties in the Pacific was present for the first drop

ROYAL NEW ZEALAND NAVY

H M N Z S *Lachlan* (Survey Vessel)	Visited Christmas and Malden in February 1956 *to carry out surveys of the Operational Area*
H M N Z S *Rotoiti* (Frigate)	Acted as *weather reporting station*
H M N Z S *Pukaki* (Frigate)	Acted as *weather reporting station*

ROYAL FLEET AUXILIARIES

Fort Beauharnois	Established the *first bridgehead* on 23rd June 1956 She was used initially as logistic support and temporary Headquarters Ship and later as *Issuing Ship* for the Grapple Squadron She was equipped with large refrigerated spaces for carrying fresh provisions
Fort Constantine	Played a similar role.
Fort Rosalie	Was in addition *equipped for carrying ammunition*
Gold Ranger	Was the first tanker to arrive *Wave Prince Wave Ruler Wave Victor* and *Wave Chief* were also engaged throughout the period in carrying oil

SHIPS SPECIALLY CHARTERED BY THE ADMIRALTY

T E S *Ben Wyvis*	Was one of the first ships to arrive and carried a particularly awkward cargo including landing craft, pontoons lighters dredgers and heavy military equipment
S S *Ben Rinnes* S S *Ben Nevis*	Carried out similar duties to *Ben Wyvis*
Reginald Kerr	Carried vehicles and plant for 28 *Field Engineer Regiment*
H T *Devonshire*	Brought the first squadron of the Task Force units arriving 24th June 1956
S S *Charlton Star*	Arrived in July 1956 with the second wave of the build-up force
H T *Cheshire*	Arrived in early September 1956 carrying the remainder of the 28 *Field Engineer Regiment*
S S *Pinehill* S S *Beech Hill*	Were chartered as cargo ships

THE ARMY

The Army had to build up from scratch a considerable Township (Main Camp—700 tents and marquees and about 40 000 square feet of hutted accommodation) with its own Seaport (Port of London—100 tents and marquees 7 000 square feet of buildings twelve 105 000 gallon fuel tanks for stowing aviation fuel) and Airbase (Cassidy Airfield—including a main runway 2,150 yards long by 60 yards wide capable of holding a Vickers Valiant or a Globemaster) In addition it had to build up a road system and supply a transport service lay on mains electricity supply water—distilled from the sea provide sewage and hygiene services set up cool storage food petrol and other supply depots and provide general maintenance for an island population of well over two thousand

The main bulk of this work was completed during the period July 1956 to February 1957—and constituted a major triumph By the time *Warrior* arrived the bulk of the Army force had already commenced their journey back to the United Kingdom

28 *Field Engineer Regiment Royal Engineers* formed to undertake the task was comprised of four squadrons with a total strength of 40 officers and 931 men made up as follows

12 *Field Squadron*	A small streamlined unit
55 *Field Squadron*	The first of the Task Force units to land on Christmas Island 24th June 1956
71 *Field Squadron*	A specialist squadron comprising a *plant troop* with over 195 pieces of engineering plant and an *electrical* and *mechanical troop* This squadron had undertaken the preliminary work for *Operation Hurricane* at Monte Bello—but of the original personnel only the S Q M S remained
64 *Field Park Squadron*	Made up of a *workshop troop a stores troop* and a *transport troop*

Ancillary units included

51 Port Detachment Royal Engineers	Provided stevedores for discharge and loading of vessels at the anchorage
504 Postal Unit Royal Engineers	
2 Special Air Formation Signal Troop Royal Signals	They laid and maintained 360 miles of cable including 95 miles of high quality circuits and installed four telephone exchanges
A Royal Army Service Corps Services Unit	Was organized into an *amphibious vehicle platoon* of 10 D U K W.s to support troops on shore by maintaining a ship to shore cargo service together with a *supply detachment* consisting of a supply depot, which included a butchery and cold storage component and a field bakery service.
A Special Engineer Regiment Workshop Royal Electrical and Mechanical Engineers	Designed to give all *workshop support* to the Army units for the inspection classification repair and recovery of all types of equipment

ABOUT AEROPLANES

If the pioneers of the thirties Amelia Earhart Kingsford Smith and others who blazed the Pacific trail could have seen *Cassidy Airfield* Christmas Island they would have indeed marvelled It seems almost unbelievable that their epics were taking place less than a quarter of a century ago

The Royal Air Force formed an *Air Task Group* designated *No 160 Wing* to undertake their varied commitments which included such diverse responsibilities as dropping the weapons high and low level meteorological reconnaissance flights to assist the weather forecasters cloud photography and sampling after the burst and also more general and humdrum duties such as communications the ferrying of men materials and mail between the various islands together with such jobs as air/sea rescue and pest control Seldom if ever can such a wide variety of aircraft—ranging from the tiny Auster to the giant Vickers Valiant—have been assembled together on one airfield unless it was as part of an air show

R A F Aircraft seen at Christmas included

Vickers Valiant	The R A F s first four jet bomber in an all white anti-radiation finish This type of aircraft was used for *dropping the test weapons*
Canberra B 6	Used for *taking samples from the radio active cloud* resulting from the explosions
Canberra P R 7	Used for *high level meteorological reconnaissance* and high level cloud photography
Shackleton	Used for *low level meteorological reconnaissance* for the search of a large area of sea in order to clear it of shipping, and for such purposes as transport and photography
Hastings	Used for *running scheduled services* to Honolulu and Australia
Dakota	Used to provide a *daily service between Christmas and Malden Islands*
Auster	Used to *air-spray* the camp areas on Christmas Island in order to keep down the flies and other insects and also as a light communications aircraft within the island area This aircraft was transported to the Island inside a Hastings
Whirlwind Helicopter	Was used as an *internal communications aircraft* for air/sea rescue—at least five swimmers in difficulties were rescued by strop and for air spraying purposes both at Christmas and at Malden where following the first drop there was a plague of flies probably due to decaying bird life.

The Royal New Zealand Air Force undertook certain additional tasks with *Sunderland Aircraft* alighting in the lagoon near S P.A.L.

The *United States Air Force* transported material from Honolulu to their scientists at Penrhyn in their great *Globemasters* These aircraft were routed via Christmas Island.

H.M.S *Warrior* carried three *Avengers* They undertook the duties of search and communications On two occasions sick were transported ashore in these aircraft One of the original three was damaged in a heavy landing and rendered permanently unserviceable a second was lost when it "ditched" off Malden following a power failure shortly after take-off (fortunately the crew of three escaped unharmed) One replacement was obtained from Honolulu

Warrior also carried four *Westland Whirlwind Helicopters* These rendered invaluable service On one occasion they rescued an officer and two men from a water logged dinghy by means of a strop and on another the three occupants of the "ditched" Avenger They provided an air ambulance service from *Warrior* to Christmas Island hospital thus saving a boat journey followed by a twenty-five minute run over a poor road Ship to hospital by helicopter took eight minutes. On two occasions *stretcher lifts* were carried out from R.F.A. *Fort Rosalie* using a light aluminium stretcher specially made for the operation A helicopter also flew to Malden when *Warrior* was still 75 miles away and brought back a midshipman belonging to H.M.S *Messina* who was suffering from acute appendicitis As an aerial taxi between *Warrior* and Christmas (special *helipads* were provided at important points) they were ideal It was the standing joke that a helicopter could fly from London to Paris in under ten minutes At Malden, too for short range communication they proved indispensable

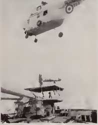

FIG 8 —Stretcher lift from *Fort Rosalie* – the patient an Indian seaman in severe renal colic (subsequently shown to be due to calculi) Seen from aft it looks easy

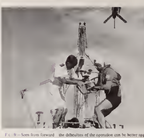

Fig. 9 — Seen from forward the difficulties of the operation can be better appreciated

WHO WAS WHO IN THE GRAPPLE MEDICAL WORLD

ROYAL NAVY AND ROYAL FLEET AUXILIARIES

Davidson R W	Surgeon Lieutenant R N Assistant Medical Officer H M S *Warrior*
Doyle M T	Ship's Surgeon Medical Officer R F A *Fort Beauharnois*
Frew J S W	Surgeon Lieutenant, R N Z N Medical Officer H M N Z S *Rotoiti*
Pall R W F	Surgeon Lieutenant R N Medical Officer H M S *Narvik* Had been Medical Officer H M S *Narvik* during *Operation Mosaic* at Monte Bello in 1956
Pugh P D G	Acting Surgeon Commander R N Squadron Medical Officer Senior Medical Officer H M S *Warrior* Had been Medical Officer H M S *Narvik* during *Operation Hurricane* at Monte Bello in 1952.
Sanderson A L	Surgeon Lieutenant R N V R Medical Officer H M S *Alert* Had been Medical Officer H M S *Alert* during *Operation Mosaic* at Monte Bello in 1956
Short D H	Surgeon Lieutenant R N Medical Officer H M S *Cook*
Slark A G	Surgeon Lieutenant R N Z N Medical Officer H M N Z S *Pukaki*
Sugarman S	Ship's Surgeon Medical Officer R F A *Fort Constantine*
Taylor G E	Surgeon Lieutenant R N V R. Medical Officer H M S *Messina*

ARMY

Ross-Russell J	Lieutenant R A M C Medical Officer 28 *Field Engineer Regiment Royal Engineers*

ROYAL AIR FORCE

Aikman W L	Squadron Leader R A F *P M O 3 Group Bomber Command* Relieved Wing Commander Dhenin after second drop (*see below*)
Bradley J	Squadron Leader R A F *Senior Medical Officer Christmas Island*
Concuie A	Flight Lieutenant R A F V R *Assistant Medical Officer Christmas Island*
Cooper P A	Group Captain R A F *Principal Medical Officer Transport Command* Visited Christmas Island on route check
Dhenin G H	Wing Commander R A F *D P M O (F) Bomber Command* In charge of special oxygen equipment in Canberras Had been Medical Officer of H M S *Tracker* (Health Ship) during *Operation Hurricane* in 1952 Piloted Canberra through atomic cloud at Woomera during *Operation Totem* in 1953
Sturrock D	Squadron Leader R A F *Health Physics Officer to 160 Wing R A F* employed by A W R E Responsible for decontamination of sampling Canberras
Rexford-Welch S C	Wing-Commander R A F *Health Physics Observer*
Wilson D A *A F C*	Air Commodore R A F Radiologist, *Health Physics Officer to Task Force Commander* In this operation acted as sample controller from a high flying Canberra circling the cloud Accompanied Wing Commander Dhenin "through the cloud" in 1953 and collected samples Before 1953 the only way to collect these valuable samples was to fire rockets at the clouds and allow canisters to drop through them on parachutes During 1956 was present at Monte Bello for *Operation Mosaic* and at Maralinga for *Operation Buffalo*

CIVILIAN

Pen S	Assistant Medical Practitioner *Christmas Island*
Kokoe J	Assistant Medical Practitioner *Fanning Island*

Acknowledgment

In conclusion I would like to express my thanks to Surgeon Lieutenant G Taylor who very kindly gave me notes on the early exploits of *Messina* to Surgeon Lieutenant R W Davidson R N who patiently read through the proofs was cartographer and photographer made many helpful comments and pointed out some ghastly spelling mistakes, to the insect that bit my leg so thoroughly that I had to spend five days in bed during which time I was able to circumnavigate the guts of this article to all other medical officers and their staffs both of the Grapple Squadron and the other Services who were so helpful throughout the operation, to S B C P O R J Lenton for his painstaking typing and finally to Commodore R B N Hicks *D S O* R N, for permission to publish

Reference

Pugh, P D G (1953) *J roy nav med Serv.*, 34, 75

HER MAJESTY'S YACHT *BRITANNIA*

BY

Surgeon Commander P G BURGESS, R N

Britannia, which was built by John Brown and Company of Clydebank, and commissioned in January 1954 is the latest of a long line of Royal Yachts

History

In Anglo-Saxon times although the "King's ships" belonged to the Sovereign being either paid for out of his own revenue or else raised by the seaports in return for certain privileges, there was always one vessel which was reserved for the conveyance of the King himself One of the earliest recorded instances of the use of the Royal Yacht is the story of King Edgar being rowed in his barge on the River Dee by eight independent kings, who had come to pay homage to their overlord

After the War of the Roses we begin to hear of gilded barges which were used by Royalty for pageants and reviews and Queen Elizabeth, who never left England confined her maritime excursions to journeys by barge on the sheltered waters of the Thames

On his return from exile in 1660 Charles II and his family sailed from Breda to Rotterdam in a yacht with gilded and decorated cabins which had been placed at his disposal by the Dutch He was so interested in the design that the Burgomaster of Amsterdam asked permission to present him with a vessel of the same style The outcome of this offer was the *Mary* which may be regarded as the first real Royal Yacht

Both Charles and his brother the Duke of York afterwards James II, were fond of the sea and possessed between them at one time or another no less than 27 Royal Yachts Most of these vessels were named after members of the Royal Family, but several of them including the *Cleveland*, the *Portsmouth* and the *Fubbs* were named after the ladies of the Court whom Charles delighted to honour

George III enjoyed sea travel and was in the habit of spending part of his summer holidays at Weymouth, where his yacht, usually the *Princess Augusta* was always in attendance to take him and his family on marine excursions along the south coast During his declining years two new yachts were put in commission, the *Royal Sovereign* built in 1804, and the *Royal George*, built in 1817 The latter was actively employed until 1843, and was then

used for sixty years as a hulk to accommodate the officers and men of the Royal Yachts A relic of the *Royal George*, an ornate binnacle, is fitted in *Britannia* at the forward end of the verandah deck

Queen Victoria enjoyed yachting and made full use of the vessels at her command for her State Visits to the Continent and for summer visits to various parts of the British coast In 1843 the first steam Royal Yacht, the *Victoria and Albert* was launched at Pembroke She was the Queen's principal yacht for twelve years when her name was changed to *Osborne* on her supersession by the second *Victoria and Albert* and she continued in service until she was broken up in 1867 The second *Victoria and Albert*, also a paddle-steamer, was a great favourite with Queen Victoria with her unprecedented speed of 17 knots There were other Royal Yachts during the Queen's long reign which were used as tenders to the *Victoria and Albert* or for other members of the Royal Family The *Elfin*, for example maintained for fifty years the daily service between Cowes and Portsmouth when ever the Queen was in residence at Osborne The second *Osborne* was used on many occasions by the Prince and Princess of Wales for cruises in the Mediterranean

Queen Victoria was deeply attached to the *Victoria and Albert* and strongly resisted the building of a successor, but when it became apparent that the old ship was nearing the end of her days, she consented to the laying down of another vessel of the same name with the stipulation that the fittings and ornamentation which had been designed by the Prince Consort and which she loved so well should be copied in the new *Victoria and Albert*

The third *Victoria and Albert* was launched at Pembroke in 1899 by the Duchess of York afterwards Queen Mary The *V & A* by which name she became affectionately to be known had an unfortunate start to her career as whilst she was being undocked on her completion she developed a list and was only prevented by the sides of the dock from turning turtle Queen Victoria never sailed in her as she died a few months after her completion

For more than half a century the *V & A* remained as the principal Royal Yacht What changes have taken place in the Royal Navy since that day in June 1902 when King Edward VII reviewed his fleet in the new yacht at his Coronation celebrations! Of the battleships cruisers and destroyers which were drawn up in that array, all have gone long since to the breakers' yard but the *V & A* outlived them all With her gleaming black hull decorated with gold, her graceful clipper bow her white upperwork her two bell-topped funnels and her three buff masts wearing the flag of the Lord High Admiral at the fore the Royal Standard at the main and the Union Flag at the mizzen she was admired by thousands at many naval reviews and at ports all round Europe Stripped of all her treasures many of which are now in *Britannia* she was towed to the ship breakers' yard in 1953 By a twist of fate she left Portsmouth one day as *Britannia* was steaming in

The only other Royal Yacht built this century was the *Alexandra* She replaced the *Osborne* in 1908 and survived until after the First World War,

when she was sold to a Norwegian Shipping Company by whom she was renamed *Prince Olaf*

The Royal Yacht Service

One of the unique features of *Britannia* is that she is commanded by a Flag Officer known as the Flag Officer Royal Yachts, and he does actually handle the yacht himself just like the Captain of any of H M Ships

The officers as a general rule are appointed for a period of about two years In the V & A some of the senior officers remained for many years Perhaps the Medical Department holds the record in this respect as I was only the fifth medical officer to serve in Royal Yachts since 1890 One medical officer joined the V & A as a Surgeon and left as a Surgeon Rear-Admiral well over twenty years later!

Of the ratings about two-thirds belong to the permanent Royal Yacht Service This Service had to be reconstituted in 1953 for the commissioning of *Britannia* as very few Royal Yachtmen (as they are now called) remained from the V & A This was done by calling for volunteers from the whole Navy the final selection being made by a Board composed of officers already appointed to *Britannia* All ratings selected for the Royal Yacht Service have to serve a probationary period of one year before final acceptance after which they are paid an allowance of 1s 0d per day

Promotion within the Royal Yacht Service can of course, only be made as vacancies occur but no rating is promoted who is not fully qualified by General Service standards The junior ratings are thus encouraged to take courses and pass the necessary examinations for promotion When their Form B 13 arrives, they are given the option of either remaining on in their present rating or of being promoted and reverting to General Service Many for a variety of reasons often financial choose the latter course so that there is a healthy change particularly amongst the junior rates

The remaining one-third of ratings are drafted in the usual way, if possible from the waiting list of those wishing to join the Royal Yacht Service and do not remain as a rule for more than two years

The Medical Department

The present complement is one Surgeon Commander one S B P O (O) and one S B P O (M) Both the latter are permanent Royal Yachtsmen and have served in *Britannia* since her commissioning

On certain occasions on Royal Duty it is considered desirable that a Surgical Specialist should also be carried When Surgeon Captain D D Steele-Perkins Royal Navy is appointed he joins as a Member of the Royal Household and assumes medical charge of all those who live in the Royal Apartments He is, of course also ready to give advice on the treatment of any officer or rating In fact he did the first operation to be performed in the Yacht on the day the Queen stepped on board for the first time, an appendicectomy on a

rating from one of the escorting frigates On other occasions a Surgical Specialist is appointed additional as a Ship's Officer This is so on Captains H L Cleave and W J Forbes Guild and Surgeon Commander P O'Brien have all served in that capacity I need hardly add how very welcome all these Specialists are when they come on board especially to the P M O !

The Medical Officer's Consulting Room is situated just forward of the Royal Apartments with the Sick Bay adjacent to it This is designed on very similar lines to those in the larger H M Ships It is of course very fully equipped to deal with any surgical emergency with a full-scale operating table and anaesthetic machine The new type of Portex X-ray machine is carried and the necessary apparatus for all types of physiotherapy

When *Britannia* commissioned it was decided that the scale of medicine etc to be supplied should be the same as for a Cruiser As the Sick Bay must be able to supply, or obtain at very short notice practically everything but toothpaste, it has meant in fact that there are about 475 items held above the scale This is quite a problem when rendering the Store Account!

ROUTINE

The Yacht is run on very much the same lines as any other H M Ship of comparable size Any idea that everyone is always on leave when she is in Portsmouth is quite false A great deal of hard work is required to keep the Yacht up to her very high standard of cleanliness and efficiency

One is led to understand that in the 1 & 4 the routine was rather more leisurely A former officer recounted that he joined her when she was lying at a buoy in Portsmouth Harbour He unpacked his bags and after dinner he decided to go ashore to a cinema He asked the Duty Officer for a boat and as he stepped into it was asked What day will you be returning, Sir?" On another occasion so I was told the Yacht was suddenly required for a Royal trip and it was found that the Navigating Officer was in Canada

One difference from the ordinary H M Ship's routine is that there are no punishments on board Should for example a rating return adrift from leave or return on board under the influence, he is considered to have fallen below the high standard required of a Royal Yachtsman and leaves at the first opportunity

CUSTOMS

There are many customs associated with the Yacht of which the following are some examples

(*a*) Officers wear exactly the same uniform as is worn in General Service except that they do not wear a link button in their mess jackets All ratings wear a "Royal Yacht" flash on their right arm and where ratings in General Service would wear red badges, they wear white ones Ratings dressed as Seamen in their No 1 suits wear the serge jumpers inside their trousers which are made of linen and have a black bow down the back The cap ribbon just has Royal Yacht" on it, with a crown between the two words

(*b*) Only the Queen and those to whom she wishes to accord that honour are piped over the side Thus the Duke of Edinburgh in uniform is piped

(*c*) The Yacht of course is never open to the public When a Member of the Royal Family is embarked no visitors are permitted At other times visitors are allowed only by the personal invitation of an officer or Royal Yachtsman

(*d*) Royal Yachtsmen are allowed to buy a pint of beer every day from the Canteen

(*e*) At dinner in the Wardroom the loyal toast is always drunk standing At noon on the Queen's actual birthday, all officers meet in the Wardroom to drink her health

(*f*) When the Royal Yacht Band is embarked it plays for Colours every morning of the week, including Saturday

(*g*) All officers are commanded to appear at one of the Garden Parties at Buckingham Palace each year and also receive badges for themselves and their wives for the Royal Enclosure during the Royal Ascot Meeting

Her Voyages

During the first three years of her commission, the Yacht steamed nearly 90 000 miles This took her to many parts of the world In addition to the World Tour of 1956–7, which is a story in itself she visited Canada, the West Indies the Mediterranean on many occasions and all the Scandinavian countries except Finland In home waters she steamed round the north of Scotland on three occasions, visited many of the ports both naval and commercial round our coast and was present at Regattas at both Cowes and the Clyde

Any medical officer who has the good fortune to serve in *Britannia* may look forward to the most interesting and fascinating experience of his whole career

Acknowledgment

I am most grateful to Vice Admiral Sir Conolly Abel Smith, *K C V O C B* and Captain W J Munn, *D S O*, *O B E* R N, for permission to publish this article

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CLASSIFIED MEDICAL REFERENCES IN THE WORKS OF SHAKESPEARE

BY

Surgeon Commander J. W. L. CROSFILL, R.N.

PART XIV

Weeping

1650 *1st Player* ... threatening the flames
With bisson rheum —*Hamlet* ii 2
(bisson rheum blinding tears)

1651 *Polonius* Look where he has not turn'd his colour, and
has tears in's eyes —*Hamlet* ii 2

1652 *Hermione* I am not prone to weeping, as our sex
Commonly are —*Winter's Tale* ii 1

1553 *Leonato* How much better it is to weep at joy than to joy
at weeping —*Much Ado About Nothing* i 1

1654 *Duncan* ... My plenteous joys
Wanton in fulness, seek to hide themselves
In drops of sorrow —*Macbeth* i 4

Whores

(*See also* Brothels, Syphilis)

1655 *Pander* Search the market narrowly We lost too much
money this mart by being too wenchless

Bawd We were never so much out of creatures. We have but poor
three ... and they with continual action are even as good as
rotten ... they are so pitifully sodden

Pander The poor Transylvanian is dead, that lay with the
little baggage —*Pericles* iv 2

1656. *Lysimachus* ... tis the better for you that your resorters stand upon sound
legs How now wholesome iniquity! Have you that a man
may deal withal and defy the surgeon?—*Pericles* iv 5

1657 *Marina* Who is my principal?

Lysimachus Why your herb woman she that sets seeds and
roots of shame and iniquity —*Pericles* iv 5

1658 *Bertram* ... She's impudent my Lord
And was a common gamester to the camp —
All's Well That Ends Well v 3

Wild-Eyed

1659 *Lennox* What haste looks through his eyes? So should he
look that seems to speak things strange —*Macbeth*, i 2

Wills

1660 *Pericles* I'll make my will then, and as sick men do —*Pericles* i 1.
1661 *Slender* I never made my will yet, I thank heaven
I am not such a sickly creature —*Merry Wives of Windsor* iii 4.
1662 *Romeo* Bid a sick man in sadness make his will —*Romeo and Juliet* i 1.

(Shakespeare died on 23rd April 1616. The cause of his death and the details of his illness are not known. His will was first drawn up on the 25th January that year, the date being altered to March. His signature appears three times on it in what can be described as shaky writing. On the face of it it would appear that he envisaged the possibility of his death some three months before it occurred. This would suggest that he had a chronic illness of which he was aware and an illness of which the dismal prognosis was apparent. This opinion would be strengthened if it were known whether or not the poet was voicing his own sentiments in the quotations above. Unfortunately this cannot be relied on. There is some evidence gathered by Lord Campbell in his "Legal Acquirements of Shakespeare" that suggests that at some time the poet had worked in a lawyer's office, although with true legal caution his lordship refuses to pass any opinion on the evidence he has gathered. If this were so, then perhaps his legal training may have persuaded the poet that he ought to make his will irrespective of any illness.

Shakespeare retired from active theatrical life when he was in the late forties, about 1611. He had earned for himself a modest fortune and had acquired property. There are records to show that he engaged in civic affairs during the next couple of years. He retired whilst at the height of his success. Whether or not the cause for this retirement is to be found in ill health is a matter for guesswork. It is to be regretted that his son-in-law Dr John Hall, who treated both Shakespeare's wife and daughter, did not leave some records of his father-in-law's last illness in his published work "Select Observations on English Bodies," which only quotes cases from 1617 onwards.

A bust was placed in Stratford church some time before 1623, presumably by his family. Originally this bust was painted in natural colours, the doublet being scarlet and the gown black. The colours were restored in 1748 but in 1793 Malone, with strange taste, had the whole painted white by a common house-painter, says Hudson.

Little indeed is known of the life of Shakespeare. It has been suggested that his married life was unhappy, the will being quoted as supporting evidence and also the quotation from Twelfth Night: "Let still the woman take an elder than herself." Anne Hathaway was eight years older than Shakespeare. The only mention of his wife in the will (whose Christian name he did not use) is "Item I give unto my wife my second best bed with the furniture." It is to be noted however that the document is couched throughout in cold business-like style and that no endearments are present. His daughters' names are given but one cannot help but feel that they are inserted as a mind to legal clarity and not from any affectionate reasons. In fact his wife was not cut out of any benefit, having certain legal rights, the right of dower in the estate. It is far more charitable to assume that Shakespeare was happy in his own mind that his wife would be well looked after by his daughter and doctor son-in-law and that no specific bequest was necessary.)

Will-power

1663 *Imogen* I should be sick
But that my resolution helps me —*Cymbeline* iii 6.
1664 *Lysander* The will of man is by his reason sway'd —*Midsummer Night's Dream* ii 2.

Witchcraft

1665 *1st Witch* I come graymalkin!
2nd Witch Paddock calls. Anon —*Macbeth* i 1.

(graymalkin: grey cat. Paddock: toad. Witches were supposed to have attendant devils in the form of animals or familiars. They themselves had the power to turn themselves into animal form the better to get through small openings should the doors be closed against them.)

That [illegible] beldams
Talk of [illegible] in the shape of mice
Rats [illegible] weasels and I wot not what
That have appeared and suck some say their blood
The Witch of Edmonton by Rowley Dekker and Ford)

1666 *1st Witch* Where hast thou been sister?
2nd Witch Killing swine —*Macbeth* i 3
(It was one of the duties of a witch to destroy farmstock)

1667 *1st Witch* But in a sieve I ll thither sail —*Macbeth* i 3
(Supernatural methods of locomotion including the familiar broomstick are all described in the standard books on Witchcraft which have appeared through out the centuries One of the best known is the Compendium Maleficarum by Guazzo written in 1608 from which most of the references in this section have been taken A cockle shell is mentioned in the Discovery of Witchcraft by Reginald Scot in 1584 whilst an actual sieve is mentioned in The Life of a Doctor Fian a notable Sorcerer
The quotation goes on to say like a rat without a tail When the Devil appeared in animal form he could be detected by the fact that the animal would have no tail)

1668 *2nd Witch* I ll give thee wind —*Macbeth* i 3
(The power to produce tempests was also part of the magical armamentarium)

1669 *1st Witch* I will drain him dry as hay
Sleep shall neither night nor day
Hang upon his penthouse lid
He shall live a man forbid
Weary sev n nights nine times nine
Shall he dwindle peak and pine —*Macbeth* i 3
(Holinshed s account of the illness of King Duff written in 1578 on which Shakespeare based his play ascribed the King s illness to a well known variety of witchcraft There was a murmuring amongst the people how the king was vexed with no naturall sicknesse but by sorcerie and magicall art practised by a sort of witches he sent foorth souldiers about the middest of the night, who breaking into the house found one of the witches rosting upon a wooden broch an image of wax at the fire resembling in each feature the king s person made and devised (as is to be thought) by craft and art of the divell an other of them sat reciting certeine words of inchantment and still basted the image with a certeine liquor verie busilie the end to make away the king for as the image did waste afore the fire so did the body of the king breake foorth in sweat so that as the wax melted so did the king s flesh by the which means it should have come to passe that when the wax was once clean consumed the death of the king should immediatlie follow

16'0 *All* The Weird Sisters hand in hand
Posters of the sea and land
Thus do go about about
Thrice to thine and thrice to mine
And thrice again to make up nine —*Macbeth* i 3
(Odd numbers had a magical significance a superstition which still persists in the supposed virtues of 7 and the misfortunes attendant on 13 Chinese pagodas have an odd number of storeys said to be for the same reason The witches dance was part of the ceremonial of the witches Sabbat or meeting the approved time for which was around midnight It was to go to this unholy meeting that the witches called on their supernatural means of transport To help them on their magical pilgrimage they anointed themselves with foul ointments of which the fat and entrails of babies formed an important part The Devil attended the Sabbat in person usually depicted in goat like form with wings Humiliating obeisance had to be paid to him The ceremonies consisted of feasting usually on nauseating food and in dancing There were other ceremonial procedures such as carrying black candles the cutting off portions of the garments of initiates and finally since there were witches of both sexes a scene of unbridled licence)

1671 *1st Witch* Thrice the brinded cat hath mew d
2nd Witch Thrice and once the hedge-pig whined

3rd Witch Harpy cries 'tis time, 'tis time —*Macbeth*, iv 1

(Apart from metrical necessity the use of thrice and one is imperative for a witch who must keep to the odd numbers Harpy is the familiar)

1672 *2nd Witch* Fillet of a fenny snake
Eye of newt and toe of frog,
Wool of bat and tongue of dog,
Adder s fork, and blind worm s sting
Lizard s leg, and howlet s wing,—

3rd Witch Scale of dragon tooth of wolf
Witches mummy maw and gulf
Of the raven salt sea shark
Root of hemlock digg d i' the dark
Liver of blaspheming Jew
Gall of goat and slips of yew
Sliver d in the Moon s eclipse
Nose of Turk and Tartar s lips
Finger of a birth strangled babe
Ditch deliver d by a drab —
Make the gruel thick and slab
Add thereto a tiger s chaudron
Cool it with a baboon s blood —*Macbeth* iv 1

(It is a matter of opinion whether or not the babe was supposed to be strangled manually or by the cord accidentally The prescription is Shakespeare's own but is in harmony with the accepted witches unguents The dragon referred to is the real beast The Dragon water of the old prescriptions was Infusion of Dracunculus the popular name for which is the dragon or snake plant Of it Culpepper quotes Pliny and Dioscorides that no serpent will approach any person carrying the herb about them Mummy was included by Woodall in his drugs suitable for a ship s doctor since it is stringent helpeth fluxes of blood the bladder ulcerated and the inward distempers of the yard as also it provoketh urine and is very good to be drunk in powder against great contusions or congealed blood within the body The ingredients shown are no more fantastic than those given to Charles II as he lay dying from a cerebro-vascular pathology Apart from the various cuppings and bleedings and herbal assaults he was given pigeon dung, dissolved pearls, bezoar stone and extract of human skull)

1673 *Ford* We are simple men we do not know what s brought to
pass under the profession of fortune-telling
She works by charms by spells by the figure
and such daubery as this is beyond our element
we know nothing —*Merry Wives of Windsor* iv 2

(It is recorded in Defoe s Journal of the Plague that there was during the epidemic a remarkable increase in the number of fortune-tellers in London Among the signs that they exhibited as trade signs was the effigy of Mother Shipton This famous seeress is said to have been born at Knaresborough in 1488 and to have died in 1561 Reputedly to have been included in her prophecies were the introduction of tobacco and the potato by a noble n Sir Walter Raleigh Carriages without horses shall go Around the world thoughts shall fly in the twinkling of an eye" mention houses of glass, Iron in the water shall float as easy as a wooden boat and the like. She erred when dating the end of the world in 1881

1674 *Evans* By yea and no, I think the oman is a witch indeed
I like not when a oman has a great peard
I spy a great peard under her muffler —*Merry Wives of Windsor* iv, 2

1675 *Hobgoblin* Vile worm thou wast o erlook d even in thy birth
Anne With trial-fire touch me his finger-end
If he be chaste the flame will back descend
And turn him to no pain but if he start
It is the flesh of a corrupted heart —*Merry Wives of Windsor*, v, 5

(Anne is failing and devises a test of her own. However there is the same sort of "Heads I win Tails you lose" running through the actual tests which were used to detect witches. If a suspected witch were tortured in order to get her to confess and she failed to do so then the Devil was helping his disciple so whatever happened such a victim was doomed. One sign regarded as infallible was the finding of any areas of anaesthesia or reduced sensation on the suspect's body which must have been a fairly common finding in those hysterically afflicted. Almost as sure, especially if the person was "suspected" was the finding of the Devil's marks. These were the various skin blemishes such as naevi and the like. To be deformed old and ugly was a real danger in the days of Witchcraft.)

1676 *Othello* And I loved her
This is the only witchcraft I have used.—*Othello* i 3

(Denying his use of love potions or witchcraft in obtaining the affections of Desdemona.)

1677 *Antonio* A witchcraft drew me hither.—*Twelfth Night* v 1

(Grazzo quotes cases where innocent persons were magically and instantaneously transported.)

1678 *Melun* Have I not hideous death within my view
Retaining but a quantity of life
Which bleeds away even as a form of wax
Resolveth from his figure 'gainst the fire?—*King John*, v 4

1679 *Paulina* Or those that think it unlawful business
I am about let them depart

Leontes If this be magic let it be an art
Lawful as eating.—*Winter's Tale* v 3

(The practice of witchcraft in England was made a civil offence in 1541 and a felony in 1558. The Witches Act was passed in 1604 under James I. This monarch was actively interested in the subject of Witches and himself wrote on Demonology as well as on the use of tobacco. The punishment of witches by execution (not, in England by burning as is generally believed) was carried out under this Act until its repeal in 1736. The last witch to be executed in England was in 1722 the last one in Europe was Anna Goldlin who was executed in Switzerland in 1783. The active campaign against witchcraft can be said to have been inaugurated by Pope Innocent VIII who in 1484 decreed that witches should be convicted imprisoned punished and mulcted according to their offences. As a result of the action Sprenger was commissioned to investigate producing the book which became the classic textbook on the detection of witchcraft "Malleus Maleficarum" or the Hammer of Witches. The hunt for heresy spread to all Catholic Europe and started a wave of witch-hunting enthusiasm which lasted for at least a century and a half and did not remain solely a Roman Catholic activity. It has been estimated that in England alone some 70 000 persons were put to death between 1603 and 1680 (The Superstition of Witchcraft A Williams). In Wurtzburg in 1629 no less than 162 persons including 34 children were burnt to death convicted of this offence.

Apart from the body markings and the areas of anaesthesia found by the "prickers" there were other tests to determine guilt. One favoured by James I was the floating test. The unfortunate suspect was thrown into water having had the hands tied to the opposing feet. To float was to be condemned as a witch to sink was to be innocent. Another test used by the notorious English witch-finder Matthew Hopkins demanded that the suspected person be confined in an open room for twenty-four hours. During this period the watchers endeavoured to catch small insects. If they failed to catch any particular insect this was proof that the Devil had taken on the form of this insect an argument sufficient to condemn the suspect. Hopkins was appointed by the Commonwealth Parliament as an official witch seeker being paid twenty shillings for every attendance at each enquiry plus twenty shillings for each conviction. It is not to be wondered at that he found numerous witches. So successful was he that it came to be thought that he had rather too much familiarity with witches and that in fact he was a witch himself. He wrote a book in his own defence in 1647 The Discovery of Witches. It is traditionally told that he himself was subjected to the water test and floated.

P

Belief in Witchcraft was not confined to the uneducated class. Apart from James I other well-known figures of the time avowed their belief. Ambroise Paré and Sir Thomas Browne accepted sorcery. As late as John Wesley (1703–1791) who said that to disbelieve in witchcraft was to disbelieve the Bible and even to the present day we find the beliefs persist.)

1680 *Antipholus* Dark-working sorcerers that change the mind,
Soul-killing witches that deform the body. *Comedy of Errors* i. 2

1681 *Dromio* O for my beads! I cross me for a sinner.
This is the fairy land. O spite of spites!
We talk with none but goblins, elves, and sprites.
If we obey them not, this will ensue —
They'll suck our breath, or pinch us black and blue.
Comedy of Errors ii. 2

(The infallible prophylactics against witchcraft are the wearing of holy relics, to cross oneself or regularly to say one's prayers. According to Guazzo witchcraft was instituted by the Devil with the object of destroying mankind. To help him in this task witches were endowed by him with tremendous powers graded according to their degree of fidelity to him. In view of these tremendous powers of theirs it is somewhat surprising to the critical reader that so many of the effects produced in the cases he describes at length were little more than trivial annoyances.)

1682 *Dromio* Some devils ask but the parings of one's nail,
A rush, a hair, a drop of blood, a pin,
A nut, a cherry stone.—*Comedy of Errors* iv. 3

1683 *Rosalind.* I have, since I was three year old, conversed with a magician, most profound in his art, and yet not damnable.
Orlando Speak'st thou in sober meaning?
Rosalind By my life, I do; which I tender dearly, though I say I am a magician. *As You Like It* v. 2

(Rosalind is well aware that she is risking her life by admitting that she practised 'white' magic, as in fact she would have been. Cohen in his 'Religion and Sex' quotes two cases from the New World in which one woman was convicted as a witch because she had walked across a muddy field without dirtying the bottom of her dress whilst a man was similarly guilty because he was able to lift a barrel by one finger inserted into the bung hole. The Compendium Maleficarum of Guazzo enumerates the signs by which it is possible to determine whether or not a sufferer has been bewitched, a possibility which Sir Thomas Browne once stated. The occurrence of blisters on the tongue has been noted previously. Other manifestations were fornication, palpitation, pricking sensations, sensations of wind falling and rising, swelling sensation in the throat with a dry cough, swelling of the tongue and the uttering of strange words, hallucinations of hearing, gaps in the memory, physical inability to attend church service, the speaking of grammatical Latin by an ignorant man, fasting from food and drink for more than seven days, the impulse to jump from high places, hysterical palsies, being subject to sudden frights if the hand of the priest feels heavy on the head of the victim, sensations as of a cold wind if the head is swollen or feels constricted, acute pain in the abdomen, a lump in the throat and the like. One sign of bewitchment is specially worth recording. If the patient's diagnosis is obscure so that the physicians cannot make up their minds, or keep changing them, or if they are afraid to make any dogmatic statement, then that patient is simply bewitched. Gerard seems to be a little doubtful about witchcraft:

Many odde old wives fables are written of Vervaine tending to witchcraft and sorcery, which you may read elsewhere, for I am not willing to trouble your eares with reporting such trifles, as honest eares abhorre to heare.

Nevertheless under Snapdragon he does quote Dioscorides:

The report that the herbe being hanged about one preserveth a man from being bewitched.

An interesting survival from the terminology of the old days of witchcraft is our present work Incubus. Not a few would be astonished to learn which any good dictionary will tell what the real significance of this word was.)

1684 *Duchess* has thou as yet confer'd
With Margery Jourdain the cunning witch,
With Roger Bolingbroke, the conjurer?
And will they undertake to do me good?—*Henry VI* Part 2 i 2

1685 *Bolingbroke* Madam, sit you and fear not whom we raise,
We will make fast within a hallow'd verge —*Henry VI* Part 2 i 4
(This scene, in which a spirit is called up follows closely the directions laid down in the various witchcraft manuals The necromancer stood inside a protective figure drawn on the ground A collection of magical manuscripts in the British Museum gives full directions including the wording of the invocations One of these manuscripts belonged to Dr Caius the founder of the College
Margery Jourdemain had been confined in Windsor Castle on a charge of witchcraft but was released in 1432 The incidents in the play Henry VI Part 2 are those of her second commitment for which she was burned "to Ashes" the charge however being high treason in that her activities threatened the throne High treason was punishable by death by fire)

1686 *King* (to Jourdain etc) You four from hence to prison back again
From thence unto the place of execution
The witch in Smithfield shall be burn'd to ashes
And you three shall be strangled on the gallows —
Henry VI Part 2 II 3

1687 *Cade* Away with him! he has a familiar under his tongue —
Henry VI Part 2 iv 7
(Scot's "Discoverie of Witchcraft" 1584 says "The Irishmen will not sticke to affirme that they can rime man or beast to death *See also* 1573)

1688 *Exeter* Conjurers and Sorcerers that afraid of him
By magic verses have contrived his end —*Henry VI* Part 1, i 1

1689 *Talbot* Devil or Devil's dam I'll conjure thee
Blood will I draw on thee — thou art a witch —
And straightway give thy soul to him thou servest —
Henry VI Part 1 i 5
(Witches could be rendered innocuous by injuring them sufficiently to draw blood)

1690 *Talbot* But where is Pucelle now?
I think her old familiar is asleep —*Henry VI* Part 1 iii 2
(The Pucelle of Henry VI Part 1 is Joan of Arc who is regarded by the English as a witch It was on a charge of heresy that she was in fact condemned)

1691 *Pucelle* Now help ye charming spells and periapts —*Henry VI* Part 1 v 3
(Periapts were written charms such as the first chapter of the Gospel of St John which were worn to protect the wearer against illness and threatened danger much as "good luck" tokens are carried today)

1692 *Pucelle* Where I was wont to feed you with my blood —*Henry VI* Part 1 v 3
(Joan of Arc is acting as a necromancer in this scene calling up fiends Her statement that she has fed her devils on her own blood is strictly according to the current beliefs)

1693 *Pucelle* Then take my soul —my body soul and all —*Henry VI* Part 1 v 3
(Technically Joan's soul had already been dedicated to the infernal powers an essential preliminary to becoming a witch To offer it at this stage of her career was redundant)

1694 *York* Bring forth that sorceress condemn'd to burn
Warwick And hark ye sirs because she is a maid
Spare for no faggots let there be enough
Place barrels of pitch upon the fatal stake
That so her torture may be shortened
Pucelle Will nothing turn your unrelenting hearts?—
Then Joan discover thine infirmity
That warranteth by law to be thy privilege —
I am with child ye bloody homicides *Henry VI* Part 1 v 4

(Joan of Arc was burnt, as an agent of the devil, on the 30th of May 1431 at Rouen having been tried by a court presided over by the Bishop of Beauvais It was the custom of the time to ransom important prisoners or to exchange such No attempt seems to have been made by the French to save Joan of Arc)

Wits

1695 *Brabantio* What, have you lost your wits?—*Othello* i, 1

1696 *Iago* Thou know st we work by wit and not by witchcraft,
And wit depends on dilatory time.—*Othello* ii, 3

1697 *Maria* He is sure possess d madam for sure, the man
is tainted in s wits —*Twelfth Night* iii 4

1698 *Clown* Alas sir how fell you beside your five wits?—*Twelfth Night* iv 2

1699 *Beatrice* In our last conflict four of his five wits went halting off
and now is the whole man govern d with one —
Much Ado About Nothing i 1

1700 *Prince* Thou are so fat-witted, with drinking of old sack,
and unbuttoning thee after supper and sleeping upon
benches after noon —*Henry IV* Part I, i 2

Womb

1701 *Iago* There are many events in the womb of time which will
be delivered —*Othello* i, 3

1702 *Sebastian.* But am in that dimension grossly clad
Which from the womb I did participate —*Twelfth Night* v 1

Wounds

1703 *Sergeant* Till he unseam d him from the nave to the chops —*Macbeth* i 2
(A difficult stroke to visualize even in dagger combat. It appears however to have been at least a well known expression
Then from the navel to the throat at once he ript old Priam —Nash s "Dido Queen of Carthage 1594
I will rip you from the navel to the chin —Shadwell s "Libertine 1676)

1704 *Macduff* and like good men
Bestride our down-fall n birthdom —*Macbeth* iv 3

1705 *Falstaff* Hal if thou seest me down in battle and bestride me
so tis a point of friendship —*Henry IV* Part I v 1
(Bestriding was an act of Chevalry in which one knight stood over a fallen wounded comrade Prince Henry did this over his brother the Duke of Gloucester at the Battle of Agincourt)

1706 *Siward* Had he his hurts before?
Ross Ay on the front —*Macbeth*, v 8

1707 *Iago* I had thought t have yerk'd him here under his ribs —*Othello*, i 2.

1708 *Montano* Zounds I bleed still! I am hurt to th death —*Othello* ii 3
(Zounds an abbreviation of God s wounds)

1709 *Iago* I thought you had received some bodily wound —*Othello*, ii 3

1710 *Iago* What wound did ever heal but by degrees?—*Othello* ii, 3

1711 *Iago* Kind gentlemen, let s go see poor Cassio dress d —*Othello* v 1

1712 *Iago* I bleed sir but not kill d.—*Othello* v 2

1713 *Cassio* I m maim d for ever My leg is cut in two —*Othello* v 1

1714 *1st Officer* Where your young nephew Titus lost his leg —*Twelfth Night* v 1

1715 *Sir Andrew* Has broken my head across and has given Sir Toby
a bloody coxcomb too —*Twelfth Night*, v 1

1716. *Sir Andrew* I'll help you Sir Toby because we'll be dressed together
Olivia Get him to bed and let his hurt be look'd to —*Twelfth Night* v 1

1717 *Antony* Had I as many eyes as thou hast wounds
Weeping as fast as they stream forth thy blood —*Julius Cæsar* iii 1
(Cæsar had thirty-three wounds)

1718 *Antony* And as he pluck'd his cursed steel away
Mark how the blood of Cæsar follow'd it —*Julius Cæsar* iii 2.

1719 *Antony* Witness the hole you made in Cæsar's heart
Whilst damned Casca like a cur behind
Struck Cæsar on the neck —*Julius Cæsar* v 1

1720 *Cassius* this good sword
That ran through Cæsar's bowels —*Julius Cæsar* v 3

1721 *Brutus* Thy spirit walks abroad and turns our swords
In our own proper entrails —*Julius Cæsar* v 3

1722. *Kent* though the fork invade the region of my heart —*King Lear* i 1

1723 *Warwick* But, let us hence, my sovereign to provide
A salve for any sore that may betide —*Henry VI* Part 3 iv 6

1724 *King Henry* My pity hath been balm to heal their wounds —
Henry VI Part 3 iv 8

1725 *King Henry* The edge of war like an ill-sheathed knife
No more shall cut his master —*Henry IV* Part 1 i 1

1726 *Hotspur* I then all smarting with my wounds being cold
the sovereign'st thing on Earth
Was parmaceti for an inward bruise —*Henry IV*, Part 1 i 3
(3s 0d an ounce in 1695)

1727 *Chief Justice* I am loth to gall a new-heal'd wound —*Henry IV*, Part 1 i 3

1728 *Moth* here's a Costard broken in a shin
Costard no salve in thy mail sir O sir plantain a plain plantain
no salve sir but a plantain —*Love's Labour Lost* iii 1

1729 *Clown* to see how the bear tore out his shoulder-bone —*Winter's Tale* iii 3

1730 *Salanio* And every word in it a gaping wound
Issuing life-blood —*Merchant of Venice* iii 2.

1731 *Portia* Have by some surgeon Shylock on your charge
To stop his wounds lest he do bleed to death —
Merchant of Venice iv 1

1732 *Antony* Thou bleed'st apace
Scarus I had a wound here that was like a T
But now 'tis made an H —*Antony and Cleopatra* iv, 7
(H is meant to pun on ache)

1733 *Patroclus* Those wounds heal ill that men do give themselves —
Troilus and Cressida iii 3

1734 *Cassandra* Look how thou diest! look how thy eye turns pale!
Look how thy wounds do bleed at many vents!
Troilus and Cressida v 3

1735 *Marcus* I have some wounds upon me, and they smart
To hear themselves remember'd
Should they not
Well might they fester 'gainst ingratitude
And tent themselves with death —*Coriolanus*, i 9

1736 *Menenius* Where is he wounded?
Volumnia I' the shoulder and i' the left arm there will be large cicatrices
to show the people, when he shall stand for his place
He received in the repulse of Tarquin seven hurts i' the body
Menenius One i' the neck and two i' the thigh there's nine that I know
Volumnia He had, before this last expedition, twenty five wounds upon him
Menenius Now it's twenty seven every gash was an enemy's grave.—
Coriolanus ii 1

(The sites of these wounds are exactly where they should be after much non fatal sword combat in an infantry man wearing Roman armour Shakespeare may have chosen the sites by chance or he may have studied the pictures in current surgical textbooks of the "wound man" Paré who was a military surgeon (1510–1590) has such an illustration in his work showing the sites of election of various types of wounds the weapons illustrated being clubs daggers swords spears, arrows and lastly and marking a new era in military surgery a cannon ball in the act of striking a leg Paré has a greater claim to surgical fame in that he was one of the first to abandon the use of boiling oil for wounds substituting for it a simple salve dressing.

Although surgery was a calling of much lower degree than that of medicine in the Middle Ages—its professors holding a lower social status than their "learned" brothers the physicians—there is no comparison between the academic standards of the two From ancient times the standard of surgery and surgical knowledge was far in advance of medicine judged by our present day standards Particularly was this so in the treatment of injuries a type of practice for which there must have been ample opportunity in those tumultuous times Celsus goes so far as to say that dissection of the cadaver is unnecessary when so much anatomical material is provided by the arena and the results of robbery on the highway Broadly speaking surgery developed from antiquity by a process of steady growth of observation and experience, founded on easily observed facts On the other hand medicine had to wait until the discovery of the microscope bacteriology and biochemistry before scientific medicine could advance Numerous clinical observations had been made and recorded but the speculations, unsupported by experimental work and founded on false assumptions such as the theory of the humours, only hindered rather than helped)

1737 *Oliver* and here upon his arm
The lioness had torn some flesh away
Which all this while had bled and now he fainted
And cried in fainting, upon Rosalind
Brief I recover'd him bound up his wounds
And, after some small space being strong at heart
He sent me hither —*As You Like It* iv 3

1738 *Fluellen* I say I will make him eat some part of my leek it is good
for your green wound and your ploody coxcomb —*Henry V* iv 9

1739 *Saturninus* Now to the bottom doth thou search my wound —
Titus Andronicus, ii 3

1740 *Antony* they with joyful tears
Wash the congealment from your wounds, and kiss
The honour'd gashes whole —*Antony and Cleopatra* iv 7

1741 And drop sweet balm in Priam's painted wound
Rape of Lucrece line 1466.

1742 "[illegible] well of such a salve can speak
That heals the wound and cures not the disgrace."
Sonnet 34

1743 "The humble salve which wounded bosoms fits!"
Sonnet 120

1744 "Do wounds help wounds, or grief help grievous deeds?"
Rape of Lucrece line 1822

1745 *Boult* What would you have me do? go to the wars, would you? where a man may serve seven years for the loss of a leg, and have not money enough in the end to buy him a wooden one?—*Pericles* iv, 5

1746 *Messenger* Send succour, lords, and stop the rage betime,
Before the wound do grow uncurable;
For, being green, there is great hope of help.—
Henry VI Part 2 iii 1

1747 *Talbot* One of thy eyes and thy cheek's side struck off!—
Merchant of Venice ii 5

(This wound was produced by a cannon ball.)

WRY-NECK

1748 *Shylock* the vile squealing of the wry-neck'd fife.—*Merchant of Venice* ii 5

THE END

Clinical Notes and Cases

DENS INVAGINATUS OF A MESIODENS

BY

Surgeon Commander (D) D. L. GOODRIDGE, R.N.

Cases have been reported of the many variations in the degree of invagination of enamel tissue. Such malformation was named dens in dente by Busch (1897) and is still loosely so called. With the interest shown in this phenomenon by Kronfeld (1934) and Rushton (1936, 1937) it is now agreed that the term dens invaginatus is more accurate, including as it does, all clefts and cingulum pits in the enamel of a tooth up to the widely dilated and complex malformations which have been reported.

A case has recently been seen of a dens invaginatus with a widely dilated apical area, lying in the midline, displacing the left central incisor, and having the crown form of a supernumerary mesiodens. The appearance was remarkably similar to that of one reported by Graves-Morris (1913), being given by him the name of a dilated odontome of |3. The invaginatus form of a mesiodens has been reported only by Heslop (1952) and of bilateral supernumerary mesiodens by Archer and Silverman (1950), but in each case there were only mild degrees of invagination.

Case Report

A male aged 21 was given a routine examination on entry into the Royal Marines and was seen to have his upper left central incisor lying labial to and between the lateral and canine. The left upper central temporary incisor, carious and broken down, was lying

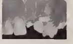

Fig. 1

between the left lateral and upper right central |2 was distally carious X rays demonstrated a large opaque body in the midline The patient was referred for consultation and surgery with a provisional diagnosis of odontome

At examination no other findings of dental significance were discovered but he had a malunited right tibia and fibula which later led to his surveying and invaliding as unfit for the Royal Marine Service Further X rays showed that his condition was an abnormality of a mesiodens probably a dens invaginatus Impressions were taken for demonstration models in view of the rarity of the condition

At operation which was done under intratracheal anaesthesia, a U shaped flap was turned back from the labial fold at the distal edge of 1| along the cervical margins of the teeth to the fold above the distal edge of |2 Removal of a thin layer of cortical bone exposed the crown and dilated edge of the root

FIG. 2

FIG. 3

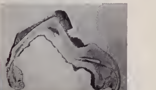

FIG. 4

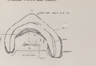

FIG. 5

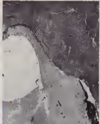

FIG. 6

⌊a was removed and 1⌋ was elevated labially and found to have a flattened apex. The mesiodens was then carefully rotated, elevated and finally removed. There was left behind a flat table of dense bone surrounded by an annular depression in which the ring of dilated tooth substance had been lying. A biopsy of this table of bone was done and reported to be dense avascular bone. The mesiodens was sent to Professor A. S. Prophet for sectioning.

The part [illegible] inexplicable and previously unre[illegible]

The hard ground section (fig. 4) showed that enamel lay over the crown and there was also a thinner layer of it at the base of the dilatation. The distribution of the pulp chamber, dentine and cementum was clearly demonstrated. It was not decided whether there was continuity of the pulp at the incisal cornu. No point of invagination could be found.

Figs. 6, 7 and 8 were taken from the areas shown in the diagram of the decalcified

[illegible]

section (Fig. 5). There w[illegible] the enamel matrix at the base of the dilatation thus showing its [illegible] also an unexpected layer of epithelium lying across the dilated cup [illegible] be continuous with the epithelium of the immature enamel and forming [illegible] cavity.

Fig. 6 shows the immature en[illegible] matrix in the upper half of the picture and a flattened area of epithelial cells next to it. The rest of the material has no structure and resembles the contents of an uninfected cyst. Fig. 7 is the area to the right of fig. 6. The dark mass is a calcific degenerative process. The lower edge of the enamel matrix is shown centrally, and dentine with which it had been in contact is at the extreme right hand corner. Fig. 8 shows the line of thicker epithelium at the base of the dilatation, the space above containing the same cystic material, and connective tissue lies below.

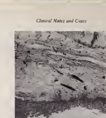

FIG. 8

SUMMARY

The very rare anomaly of a dens invaginatus of a mesiodens with a widely dilated apex is reported together with displacement of |1 distally and retention of |a. Immature enamel was laid down within the dilatation. The epithelial lining of a small uninfected cyst was also identified within the dilatation.

ACKNOWLEDGMENTS

I wish to acknowledge the kind permission of the Medical Director General of the Navy to publish this case. I am very grateful to Professor A. S. Prophet of University College Hospital Dental School for taking such an interest and for his careful supervision of the sectioning and photographing of the specimen. His reports have enabled me to write up this case and to appreciate its unusual aspects.

REFERENCES

ARCHER, W. H. and SILVERMAN, L. M. (1950) *Oral Surgery*, **3**, 722.
BUSCH, F. (1897) *Deutsche Mschr. Zahnheilk.* **15**, 469.
GRAVES-MORRIS, H. W. (1913) *Brit. Dent. J.* **34**, 917.
HESLOP, I. H. (1952) *Brit. Dent. J.* **93**, 242.
KRONFELD, R. (1934) *J. Dent. Res.* **14**, 49.
OEHLERS, F. C. C. (1957) *Oral Surg. O. Med. and O. Path.* **10**, 1218.
—— (1957) *Oral Surg. O. Med. and O. Path.* **10**, 1302.
RUSHTON, M. (1936) *Guy's Hosp. Gaz.* **50**, 438.
—— (1937) *Brit. Dent. J.* **63**, 65.

DENTAL SYMPTOMS DURING ASIAN INFLUENZA

BY

Surgeon Commander (D) G. M. PLEASANT, R.N.

DURING last winter's epidemic of Asian influenza, a number of patients complaining of dental pain were encountered. These varied from a mild tenderness or "heavy" feeling in the upper molar region possibly referred pain from the inflammation of the antral lining, to a more painful complaint of extreme sensitivity of the exposed cervical cementum and dentin of those patients who had previously a condition of chronic gingival recession.

In a few instances the pain was severe enough to elicit requests for extraction of teeth by the sufferer. This was noticeable for patients, who had they not been suffering from influenza, would have been extremely reluctant to have teeth extracted.

Palliative treatment consisting of painting the gums with mild tincture of iodine, the prescription of Anadin tablets together with the local application of Tyrosolven (a proprietary medicament containing Benzocaine) and the use of normal saline mouthwashes were found to be most effective in relieving the pain and made it possible to resist even the most insistent demands for removal of the teeth.

NIGHT CALLS IN NAVAL GENERAL PRACTICE

BY

Surgeon Captain H. E. B. CURJEL, R.N.

IN the November, 1955, issue of *The Practitioner* appeared an abstract of a report by Dr. W. W. Forbes in the *New England Journal of Medicine* (1955). In this he records and analyses 200 consecutive night calls in general practice.

In H.M. Naval Base, Singapore, there are two naval general practices working side by side, and it was thought that it might be interesting to record the night calls in both these practices over a period of a year.

The two practices are:

(1) *The Medical Guard*.—This operates from the Sick Quarters in H.M.S. *Terror*. The medical officers who form the roster are from H.M.S. *Terror* and the Royal Malayan Navy and from H.M. Ships when they are in the

Naval Base The permanent numbers of patients (approximately) for whom the practice is responsible are

Ships' Company H M S *Terror*	670
Royal Malayan Navy	610
Asiatic Dockyard employees (after working hours)	8,880

The numbers are considerably increased at various times of the year by the presence of H M Ships R F A Ships, and visiting foreign warships and merchant ships

(2) *The Families' Medical Practice* —This is operated by the Families' Medical Officer from his own house except when he is officially off duty when a stand-by medical officer takes over His practice consists of all European male dockyard personnel and all European wives and children (Dockyard and Naval) The number in this practice is approximately 2 350

For the purposes of this article a 'night call' was defined as one received between the hours of 2330 and 0630

MEDICAL GUARD PRACTICE

Type of Case	*European*		*Asiatic*	
1 Major Medical	4	2 Asthma 1 Urticaria 1 Coronary Thrombosis	40	includes 12 Asthma 3 Poisonings (2 camphor 1 opium)
2 Minor Medical	11		55	
3 Major Surgical	8	includes 2 Acute Appendicitis 4 Renal Colic	7	1 Acute Appendicitis 6 Renal Colic
4 Traumatic Surgical (Road Accidents etc.)	11	4 due to R A	5	1 due to R A
5 Minor Surgical	29		5	
6 Obstetrical and Gynaecological	Nil		8	
7 Major Nervous and Mental	2	1 male hysteric 1 female hysteric	Nil	
8 Minor Nervous and Mental	3		Nil	
9 Medico-Legal				
(This section includes all those cases who would not have come to see the doctor or have asked to be visited by him of their own free will but have been sent there by some third party)				
	53		5	
Alcoholism	28			
Fitness for cells	13			
Fitness for close arrest	1			
Asleep on watch	2			
Fighting	4			
CAFO 15/56	5			
Total night calls in a year	121		125	
		Total for the practice	246	

FAMILIES PRACTICE

[illegible]		
1 [illegible]	8	2 Asthma
		1 Coronary Thrombosis
		1 Otitis Media in Measles
		1 Influenza
		1 Laryngo bronchitis
		1 Pyelitis
		1 Abdominal Colic
2 [illegible]	1	
3 [illegible]	1	Acute Appendicitis
4 [illegible]	3	1 Abortion inevitable
		1 Abortion threatened
		1 Pre-eclamptic state
5 Major Ne[illegible] Mental	1	Acute Hysteria
6 Any other	1	
[illegible] calls in a year		23

COMMENTS

(1) Of the 121 cases seen among Europeans in the Medical Gu[illegible] 53 of them (43·8 per cent) were "Medico legal" cases Of these [illegible] them (52·8 per cent) were concerned with the examination of drunks There was a distinct impression that the majority of these were so mild that in civil life they would not have been examined by police surgeons nor would they have requested to be examined by their own doctors

(2) Among the Asiatics in the Medical Guard practice, the number of night calls in a year (125) is very small in a practice of nearly 9 000

(3) The small number of night calls for the Families' Medical Officer does not mean that he did not normally have a very busy day Late evening calls generally after "Father" had come home from work, were often very numerous But it could be said to indicate a good and sensible doctor-patient relationship within the practice and also that life in Singapore for the European family is by no means unhealthy

ACKNOWLEDGMENTS

I should like to express my grateful thanks to all those who have helped in the preparation of this paper Surgeon Captain W B Taylor R N, for allowing me to include cases occurring in the Medical Guard Practice during December 1957, when he was "Senior Partner" and Surgeon Captain C P Collins D S C, R N and Surgeon Commander J Glass R N for similar facilities in the Families Practice And finally to the Families Medical Officers (Surgeon Lieutenant D S Jones R N and Surgeon Lieutenant D Watney, R N) and to all those medical officers of the Guard whose slumbers were disturbed to provide the facts

A CASE OF COMBINED ALCOHOLIC HALLUCINOSIS AND DELIRIUM TREMENS

BY

Surgeon Commander G G WALLIS, R N

CASE REPORT

A MALE aged 27 was admitted to his Sick Bay on 4th February 1958 with a two days history of sore throat and head cold His temperature was in the region of 100 F

On the 6th he jumped out of bed because he said there was a mouse in it He then expressed the false beliefs that his Commander wanted to see him and that his wife was in the district He remained pyrexial and pneumonic signs were found at the left base

On the 7th he was transferred to hospital He was then mildly agitated and restless his talk was rapid fragmented and often irrelevant and he was grossly disorientated for place He saw hallucinatory cats and dogs with whom he carried on conversations and he heard shouts for which there was no objective basis His memory attention and grasp were all impaired.

Physical examination showed a well nourished man with warm and mildly erythematous skin His pupils were rather dilated, there was a fine lateral nystagmus in both directions and his movements were a little ataxic. His tongue was furred and there was bronchial breathing at the left base He had no tremor and no other significant abnormality was found

Treatment with penicillin and sodium amytal was started but he tore up his sheet because he thought there were dead cats rolled in it He saw geese on the deck, sparrows through the window fish scales on his hands and threepenny pieces everywhere Staring out of the window he remarked with amusement Look at old Chiefy there covered in cats and sparrows Then, fashioning his bedclothes into shapes which he took to be ducks he proceeded with evident enjoyment to strangle them He shouted banged on the walls and referred to friends by their Christian names Ultimately he refused to stay in bed because according to his perceptions it was occupied by children and although at his request they moved over to make room for him his mother arrived unwanted on the scene and demanded what little space he was occupying. He remained very noisy and over-active all night and did not sleep at all although his mood was in the main jocular and friendly and he was never scared by his experiences

The next morning chlorpromazine therapy was initiated and his confusion and hallucinations immediately began to subside By the 9th he was fully rational orientated and coherent. He remembered little of the events of the previous few days, but recalled that he had heard the voices of friends talking to him

Chest X ray showed an area of diminished translucency at the left base posteriorly but on the 20th the lung fields were within normal limits

In giving his history he admitted that after July 1956 when his marriage broke up he sought solace in alcohol This drinking then became habitual and he consumed large quantities of rum beer and gin, often going without breakfast and supper

He related that when he was 7 his father who was a heavy drinker left his mother Evidently his family history was otherwise stable but, owing to his alcoholism he had become estranged from all his relatives. He appears to have been a happy child although his schooling was disrupted by the bombing of London. He joined the Royal Navy from the Training Ship Exmouth and apart from two days absence over leave after the termination of his marriage had an uncomplicated and reasonably successful Service career

His marriage took place in March 1956 because a baby of whom he was the father was already born In the following May when he was overseas, his wife disappeared leaving the child with his sister

After his recovery from his acute illness he [illegible] alert and co-operative although rather brisk in speech and manner. He was given a three-day course of apomorphine aversion treatment before being returned to duty. When seen a month later he had remained well but was not completely abstinent from alcohol.

Comment

According to Mayer-Gross, Slater and Roth (1954) auditory hallucinations occurring in the course of delirium tremens are rare but mixed pictures of delirium tremens and hallucinosis have been observed. This short and acute illness seems to belong to the latter category. There were vivid auditory hallucinations and it is interesting that they were the only abnormal perceptions which he subsequently remembered. Although there was no tremor and little anxiety, disturbance of equilibrium or constitutional disorder, the variegated animal hallucinations were typical of delirium tremens.

His hallucination of fish scales was an unusual haptic disorder and the perception of threepenny pieces was possibly unique.

Pneumonia was an obvious precipitating factor. Dramatic return to a normal mental state after only three days of psychiatric disturbance was most probably due to chlorpromazine. This rapid termination conflicts with the belief of some psychiatrists that the occurrence of auditory hallucinations in delirium tremens indicates a less favourable prognosis for complete recovery (Mayer Gross *et al* 1954).

I am grateful to Surgeon Rear-Admiral L. T. S. Rudd, *C.B.*, *C.B.E.*, Q.H.S. for permission to publish this note.

Reference

Mayer-Gross, W., Slater, E. and Roth, M. (1954) Clinical Psychiatry. London.

AN UNUSUAL DIVING INCIDENT

BY

Surgeon Lieutenant Commander J. S. P. RAWLINS, R.N.

Diving is an occupation which is attended by a number of separate specific hazards with which the experienced diver learns to contend. Should he fail to guard adequately against any one of these his consequent loss of control of the situation will tend to expose him to other hazards and a rapid deterioration from a minor to a serious diving accident may result.

This was the case recently with a diver under instruction who was carrying out an exercise at a depth of 70 ft.

The diver was wearing a flexible diving dress surmounted by a semi-rigid rubber-and-metal helmet. He was breathing a mixture of 60 per cent. oxygen and 40 per cent. nitrogen supplied by a self-contained semi-closed-circuit apparatus comprising reducing valve, rebreathing-bag and carbon dioxide absorbent. The purpose of the nitrogen in this system

Diver.—Conjunctival haemorrhages and oedema and discoloration of the face resulting from squeeze.

is to dilute the oxygen and thereby ensure that the oxygen partial pressure at the working depth never exceeds two atmospheres absolute for at greater partial pressures oxygen becomes dangerously toxic. The nitrogen itself however contributes a problem for the diver consumes only oxygen from the breathing bag and unless this is constantly replenished the percentage of oxygen in the bag will steadily fall. This is prevented by maintaining a continuous flow of gas mixture from the supply cylinders and since the mixture includes nitrogen as well as oxygen it is necessary to vent off the excess gas through the relief valve on the breathing bag. The rate of flow is determined by the rate of consumption of oxygen which depends in turn upon the working depth. It is achieved by adjustment of the reducer the object being to ensure that at all times during the dive an adequate percentage of oxygen is available.

On this occasion the diver himself set the flow of the reducing valve prior to entering the water and checked it against a flow meter. He then descended a shot rope to the bottom and began his task which was to make his way along to the end of a 1 000 ft jackstay and back. The visibility was nil and he was considerably hampered by the tide.

It was soon apparent that the flow was incorrectly set because there was no sound of bubbles issuing from the relief valve; however the trainee diver whose start had been delayed owing to minor technical troubles decided to press on determined to catch up with his colleagues who were ahead of him on the jackstay, flushing his bag through at frequent intervals in order to avoid nitrogen build up. However in endeavouring to negotiate an obstacle he lost contact with the jackstay and becoming exhausted in his struggle against the tide signalled his desire to come up.

In these exercises each diver is attached by a life line to a safety float which indicates

his position [illegible] provides [illegible] eating with the diving boat and of reaching the surface Following the [illegible] sign [illegible] he was instructed to ascend his safety float line and this he commenced to do When about three-quarters of the way up he suddenly blacked out and fell to the bottom and was forthwith hauled up into the boat

His suit and set were cut off and he was seen to be unconscious and breathing stertorously his face and neck were a dusky purple Ten minutes later he had a mild convulsion but after a further ten minutes he had recovered sufficiently to realize where he was. He coughed up a small quantity of blood and complained of a violent headache and a stabbing pain on moving the eyes In less than half an hour after the accident he was admitted to R N Hospital Haslar and by that time his cyanosis had decreased and was limited to an area around his nose and eyes There were in addition bilateral subconjunctival hæmorrhage and some bleeding from the nose Recovery was uneventful

Discussion

The underlying cause of this accident was hypoxia due to incorrect setting of the reducer Atmospheric air contains roughly 21 per cent oxygen and the practical maximum rate of consumption of oxygen by a diver is 2 litres per minute In theory therefore a man at 66 ft (3 atmospheres absolute) could be satisfactorily supplied with oxygen by a mixture whose flow was such that the percentage of oxygen in the bag would never fall below 7 per cent (equivalent to 21 per cent of one atmosphere) with a maximum rate of consumption of 2 litres per minute However if he were to attempt to surface with only this percentage of oxygen he would rapidly become grossly hypoxic and for this reason the flow is always adjusted so that the proportion of oxygen in the breathing bag will never fall below 20 per cent For a 60/40 mixture the necessary flow at 70 ft is 4 litres per minute

In this case subsequent investigation of the breathing apparatus indicated that the flow had been set with the by pass valve leaking and when this was closed the flow dropped to 1 2 litres per minute By dint of repeatedly flushing the bag the diver had succeeded in avoiding hypoxia while on the bottom but as he pulled himself up to the surface with excess gas escaping from his relief valve the partial pressure of oxygen in his breathing bag became inadequate and he lost consciousness

He now became subject to another diving hazard—that of "squeeze" Normally the diver in a rigid or semi rigid helmet maintains the gas pressure in his helmet at or a little above the pressure of the surrounding water If the gas pressure falls below the water pressure the effect is equivalent to that of suddenly creating a vacuum within the helmet the eyes protrude from their sockets and blood is extravasated from vessels in the soft tissues of the head and neck and respiratory tract This condition may either result from a sudden failure of the gas supply to the helmet or from a sudden increase in depth of the diver without a compensatory increase in gas pressure In the latter instance the effect is directly proportional to the increase in absolute pressure so that falls in shallow water are far more serious than those in deeper water (0 to 33 ft — 1 to 2 atmospheres absolute 100 per cent pressure increase)

According to the trainee diver's estimate he had ascended three quarters

of the way to the surface (from 70 ft) when he fell. This would entail an absolute pressure increase of 100 per cent and had he been dressed as a standard diver with a rigid helmet his body would have been crushed into the helmet with disastrous results. As it was his flexible suit and helmet were moulded around him by the pressure and a significant gas/water differential pressure existed only where his facepiece was held away from his face by its rigid mounting and in his respiratory tract. The hæmorrhages were therefore confined to tissues in these areas.

For a comparison a very similar picture (less the lung damage) may be

Fig. Conjunctival hæmorrhage and œdema, discoloration and petechial hæmorrhages of the face and neck resulting from exposure to high negative G occasioned by a control failure in a Canberra aircraft.

seen in aviators who have been exposed to high values of negative "g". The mechanism is essentially the same, namely excessively high intravascular pressure causing hæmorrhagic extravasation in unsupported tissues of the face and neck. Treatment in both cases is entirely symptomatic.

SEASICKNESS TABLETS

BY

Surgeon Lieutenant R. R. A. COLES, R.N.

AND

Surgeon Lieutenant-Commander P. W. HEAD, R.N.

TABLETS of Hyoscine Hydrobromide, generally known as seasickness tablets, are supplied to all sea-going ships, whether carrying a doctor, a Sick Berth rating, or just the Coxswain with his few lecture's worth of medical training. The fact that these are 'Pusser's' and that their description is so unsophisticated seems to cause considerable scepticism as to their value. Furthermore, medical officers tend to talk in terms of *newer* and *better* anti emetics, and to give the impression that anything that can be bought across the counter without prescription or signature cannot have much value anyway (the newer drug Marzine, made by Burroughs Wellcome, is an obvious exception to this opinion). Finally, even a good name like "Kwells" cannot compete with the effective advertising possible with such expensive and closely patented proprietary preparations as 'Avomine,' 'Dramamine,' and the whole series of new anti-histamine derivatives.

A personal interest, not as a sufferer but as a frequent shipmate in small yachts with those who are, prompted one of us (R. R. A. C.) to make some trials to ascertain which drugs do seem to be the most effective. Such trials have been carried out many times before, but there were by then (1954) some new claimants to fame, Chinn *et al.* (1954) and there were also available from H.M.S. *Osprey*, Portland, a source of good experimental material. A further trial (P. W. H.), using the same series of preparations but of different plan, was carried out with the crew of H.M.S. *Dundas* (operating from Portland) whilst on a North Atlantic Treaty Organization exercise.

Previous British work (Holling *et al.*, 1944, Glaser and Hervey, 1951) has pointed to the relatively outstanding efficacy of Hyoscine in preventing seasickness resulting from short duration exposure to rough weather, and indeed most of the American work has not done less than find Hyoscine to be of the same order of efficacy as the newer drugs (Chinn *et al.*, 1950). Further, it has been found (De Wit, 1953) that whilst both Atropine and Dramamine decrease the central effects of angular accelerations, endocranial vasolability which is an indirect response to linear accelerations (the more significant ones in seasickness) is reduced by Atropine only. With this superiority of Hyoscine in mind, and accepting the undesirable side-effect of dryness of the mouth, the Royal Naval Personnel Research Committee (R.N.P.R.C.) recommend the use of Hyoscine in the new life rafts, with which all ships will eventually be equipped. That it is also probably safer and certainly less expensive than the anti-histamines would not appear to have influenced its choice as the routine service anti-emetic and especially for the life-rafts.

Some American trials, with soldiers in troopships suffering prolonged exposure to rough weather, used Hyoscine in the dosage recommended by the R.N.P.R.C., and found that side-effects such as blurring of vision and mental disorientation rendered its use impracticable, and that the longer acting of the anti-histamines were under these conditions much more effective. Literature on the administration of Hyoscine in high and prolonged dosage is rather scanty, though Glaser (1953) found few side-effects in 20 subjects with four-day dosage.

An attempt (R. R. A. C.) to carry out a trial of Hyoscine in the dosage recommended by the R.N.P.R.C. was therefore made. This proved to be on a very small scale largely due to preoccupation with normal duties, but the results are nevertheless worth recording, and the trials might well be repeated by any other medical officer serving afloat who has a little time on his hands.

This trial was carried out on patients accommodated in the sick bay on board H.M.S. *Tyne* during 1956. Nothing more than side-effects were looked for, as in occasional cases only would the ship's motion have been enough for any possible correlation with anti-emetic effect.

COMPARISON BETWEEN HYOSCINE AND SOME NEWER ANTI-EMETICS

(I) *H.M.S. Osprey*

The subjects were those officers and ratings who were undergoing training in the practical side of underwater control of anti-submarine warfare. Later, courses of sea-cadets were also included, but their value was mitigated by their availability only in the calmer summer months, and by the fact that some of the cadets were too small to be given the full adult dose.

Only those who admitted to being somewhat subject to seasickness were selected. A full explanation of the trials was given to them and on suitably windy days as they left *Osprey* to go to their ships they were given their drug in a capsule with a sip of water. Neither the subjects nor the medical officer conducting the trials had, at the time of administration, any knowledge of which drug each subject was given, and the capsules containing them were identical in colour and size. On return to *Osprey* they completed forms giving details of their experiences, with a note on weather conditions actually encountered.

On successive days they would receive a different drug, but care was taken to ensure that sequential effects were minimized, i.e. any one drug would not always be followed by one or other drug in particular, but rather by any of the other four according to a prearranged alternation of sequence. The subjects used were of particularly good value for comparison in that they were all at sea at the same time, in the same ship and doing the same work in the same part of the ship, also they were of similar age and intelligence, they had all been ashore for the same length of time, and they had nearly all risen at the same time and eaten the same breakfast. Finally their periods at sea were short (about six hours only in rough water) which allowed for little

adaptation to take place from one day to another and which were well within the limit of duration of effect of all the drugs concerned

The drugs used were—Largactil 50 mg , Avomine (anti-histamine Phenergan derivative) 25 mg ; Lactose as placebo Ancolan (an anti-histamine whose other names are Bonamine, Sea-legs,' Postafene and Meclozine) 50 mg , Hyoscine Hydrobromide 1 mg For those sea cadets who were of considerably smaller stature—35 mg of Largactil or Ancolan, 2/3 mg. of Hyoscine, or 17 mg. of Avomine were given Dramamine (anti-histamine Benadryl derivative) was not tested as most authorities agree that it is rather less effective than Avomine

Results obtained are tabulated below

	Number vomiting			*Number nauseated*			*Number exposed*		
Drug	*R N*	*S C*	*Total*	*R N*	*S C*	*Total*	*R N*	*S C*	*Total*
Largactil	4	4	8	10	4	14	10	4	14
Avomine	4	0	4	5	4	9	10	5	15
Placebo	5	3	8	8	4	12	10	5	15
Ancolan	7	3	10	10	4	14	10 ,	6	16
Hyoscine	1	1	2	4	4	8	10	6	16

R N — Naval personnel S C Sea Cadets

The subjects were divided into groups of five (all in one ship) and have only been included in the "number exposed" if one or more of the group was actually sick on the day concerned

The protection rates calculated as percentages give the most valuable information and the formula used in calculating them is

$$\% \text{ protection rate} = 100 \times \frac{(\% \text{ affected in control} - \% \text{ affected in spite of drug})}{\% \text{ affected in control}}$$

% Protection Rates—Vomiting

Drug	*R N*	*S C*	*Combined*
Largactil	20	−67	−8
Avomine	20	100	49
Ancolan	−40	17	18
Hyoscine	80	72	76
% of controls vomiting	50	60	53

% Protection Rates—Nausea

Drug	*R N*	*S C*	*Combined*
Largactil	25	25	−25
Avomine	37 5	0	25
Ancolan	25	16	−9
Hyoscine	50	16	37 5
% of controls nauseated	80	80	80

The incidence of side-effects on calm days or on days when sailing was cancelled after the drugs had been taken is tabulated below It should be

realized that the high incidence of these after the placebo is only partly due to the natural suggestibility of the sailor, but it is also due to the fact that the criterion taken for calmness was that no one in each group of five subjects in any one ship on any day vomited. Some of the so-called calm days were in fact far from calm, and therefore many of the side-effects recorded are probably early symptoms of motion sickness.

	Complaining of drowsiness Nos			*%*	*Nos complaining of other effects*	*No exposed*		
	R N	*S C*	*R N and S C*	*R N and S C*	*R N and S C*	*R N*	*S C*	*R N and S C*
Largactil	3 +(4)	4	13 (4)	71	(a) 2 (b) 1	17	4	21
Avomine	8 +(1) •	3	11 +(1)	58	(a) 2 (c) 1 (d) 1	16	4	20
Placebo	5 +(3)	1	6 +(3)	34	(a) 2 (b) 1 (e) 1 (f) 1 (g) 1	18	4	22
Ancolan	8 +(4)	1 (1)	9 (5)	52	(a) 1 (b) 1 +(2) (g) 1 (h) 1	18	3	21
Hyoscine	7 +(3)	3 −(1)	10 +(4)	55	(a) 5 +(1) (b) (2) (h) 1 (i) 1	17	5	22

(1) +(2) etc. refer to the number of *slight* side-effects recorded and for calculation of percentages are taken as ½ positive

(a) — dry mouth	(b) — headache	(c) — no micturition
(d) — sore throat	(e) — weakness	(f) — slowness
(g) — laxative effect	(h) — bad taste in mouth	(i) — hunger

One final, but admittedly useless piece of information was gained from the *Osprey* trial, namely that there is no link between proneness to seasickness (as measured by a past history) and the subject's degree of aural pitch discrimination (*see* table opposite).

This can be interpreted as disproving a drawing-room contention that 'those with a musical ear are more prone to seasickness'. A musical ear, and good pitch discrimination may well be largely an acquired characteristic in contradistinction to any tendency towards seasickness which is presumably inherited.

Pitch discrimination	*Nos admitting to seasickness*	*Per cent*	*Nos not admitting to seasickness*	*Per cent*
More than 20 c.p.s. in both ears	145	62	98	62
20 to 11 c.p.s. on one or both ears	67	28.5	46	29
Less than 11 c.p.s. in one or both ears	22	9.5	14	9
Total	234	100	158	100

(2) *H M S Dundas*

These trials were carried out on passage to Brest during a NATO exercise in May 1956. The plan of the trial differed from the earlier one in several important ways with the result that no straightforward addition of their results is permissible.

The subjects under comparison were of different ages and seniority; they were working and living in very different parts of the ship, and they had had very unequal periods of sea service immediately prior to the occasion.

Although a considerable proportion of the cases of seasickness were within a few hours of sailing, much of the time in rough water must have been spent well after any effective amount of Hyoscine could have remained in the body.

Lastly, most of those seasick on the exercise succumbed, at least in part, to the after effects of over indulgence in foreign alcohol the night before.

The results are tabulated below

Protection	*Total No tested*	*Total No sick*	*Per cent sick*	*Per cent protection rate*
Control	12	6	50	—
Ancolan	16	7	44	12.5
Avomine	16	5	31	37.5
Hyoscine	17	5	29	41
Largactil	14	7	50	Nil

Side-effects were: Drowsiness—50 per cent of those treated with Ancolan.
Dryness of mouth 55 per cent of those treated with Hyoscine.

These results can be seen to be similar to those of the first trial both as regards protection from vomiting and Hyoscine's side effects; the drowsiness attributed to Ancolan is, however, an additional finding.

Personal supervision revealed that there may exist true individual preference (i.e. based on actual efficacy only) for one particular drug or another irrespective of whether or not it gives the highest overall protection rate. Three subjects found Hyoscine ineffective but were quite happy with Avomine, whilst another (an officer) found in Hyoscine a ' wonder-drug '.

As there was no question of the subjects knowing which drug he had taken until after the experiment, there is here some support for the popular idea of "finding which drug really suits me" and less for it being merely a matter of confidence in the drug, which in turn depends on good advertising both by the manufacturers and by doctors. Further trials, in which the subject's

complete co-operation might well be expected, could further elucidate this point and be well within the scope of a destroyer or frigate Medical Officer at sea

Forty-eight Hours' Dosage with Hyoscine Hydrobromide

Subjects—Patients allowed up, but confined to the sick bay on board H M S *Tyne* Those with upper respiratory infections, or with obscure illnesses and all abdominal cases were excluded. The majority were therefore orthopædic cases, and "sick-transfers" accommodated in the sick bay for passage back to the United Kingdom The numbers were considerably limited by lack of their availability at some times and by the pressure of work in the sick bay at other times

Dosage—1 mg *stat* (equivalent to three naval "seasickness tablets") at 1500 followed by ½ mg eight hourly (at 2300, 0700 etc) for five doses This amounted to 2 mg in the first day and 1½ in the second Observations were made before the initial dose and at approximately 1100 and 1700 throughout the trial and twice after the last dose The observations made included general subjective and objective opinion pupil diameter distance of near point from the eye, an enciphering test, and a final questionnaire A random selection of cases were given Placebo tablets of the same size, shape and colour, but neither patient nor medical officer were informed whether they were having Hyoscine or Placebo until after the trial Where possible, with the same individual the tests were repeated in such a way as to give a true cross-over experiment

Opinions—These are tabulated below

Opinion	*Hyoscine*	*Placebo*
Drowsy or tired	7 (including 4 objectively so) (1 when rough)	2 (including 1 objectively so) (rough on both occasions)
Headache	1	1
Giddiness	3 (including 1 when rough)	1 (rough)
Mental dullness and forgetfulness	2	—
Dry mouth	3 (including 1 ? hangover)	1
Nausea	2 (including 1 ? hangover and 1 when rough)	1
Insomnia sweating, salty taste in mouth burning taste in gullet	0	1 case of each
Diplopia and blurred vision	1 case (aged 43 and slight mydriasis lasted twenty four hours after last dose)	0
Bitter taste in mouth	1	0
Total numbers under test	14	9

When questioned after the trials no one admitted that they would not like to take either drug or placebo again.

Pupil Size.—Not actually measured, but recorded as small, small average, average, large average, or large. Lighting fairly constant, though tending to be lighter at 1100 than at 1700. Increase or decrease in size from that recorded before the first dosage was calculated numerically on the system, +1 for an increase from average to large average, −2 for a decrease from average to small, etc. On this system results obtained were

	Hyoscine					*Placebo*				
Time	(1) 1700	1100	1700	(2) 1100	1700	(1) 1700	1100	1700	(2) 1100	1700
Sum of units of increase in size	11	4	13	5	6	3	−2	5	2	5
Numbers observed	14	14	13	14	13	9	9	9	9	9
Per cent increase	79	29	100	36	46	33	−22	56	22	56

(1) initial dose at 1500 (2) final dose at 0700

It should be noted that the figures for 1100 are smaller than those for 1700, this presumably is due to the better lighting at 1100. The last per cent increase is roughly the same in each, and it can be inferred from this that the effect of Hyoscine in this dosage has worn off by ten hours after the last dose. Some mydriasis as the result of this dosage of Hyoscine is apparent, and this is maximal during the first thirty six hours, as can be illustrated by subtraction of the Placebo figures from the Hyoscine ones

Time	(1) 1700	1100	1700	(2) 1100	1700
Corrected per cent increase	46	51	44	14	−10

Near Point.—The distance of this from the eye was crudely measured. A slight recession was recorded in those subjects on Placebo dosage and a large recession in those on Hyoscine, but the experimental error was so great that no significance at all can be attached to these results. In the case of one older man (43) the recession of near point was, however, very definite and took some three days to recover. As already recorded it was accompanied by diplopia and mydriasis.

Encipherage Test.—A card with a simple sliding-letter cypher typed out on it was used for this. Any effect on the subject's mental concentration and ability was measured by the number of letters enciphered in three minutes and the number of mistakes made in so doing. The per cent change is tabulated on page 212.

The conclusion from these figures is that no effect on the speed or accuracy of thought, or of its application to the pen, was detected. The effect of experience with the test can, however, be seen by the subject's general increase in speed, if not of accuracy, of enciphering.

Trial	Hyoscine (1) 1700	1100	1700	(2) 1100	1700	Placebo (1) 1700	1100	1700	(2) 1100	1700
Numbers tested	14	14	14	13	14	9	9	9	9	9
Rate of enciphering Average % increase per subject	1·3	14·5	8·5	11·4	17·1	2·3	11·7	16·9	16·2	16·9
Errors Sum of increases in number	7	0	−3	−1	−1	2	−4	−1	1	2

Results and Conclusions

The numbers of subjects in these trials were very limited and the results cannot satisfy any criteria of statistical significance Nevertheless fresh support is given by them to the generally accepted opinion that for short (eight-hour) duration exposures Hyoscine Hydrobromide, taken in dosage equivalent to *three* "Kwells" or naval "Seasickness tablets" one hour beforehand is the most effective anti-emetic drug yet available For continued dosage of Hyoscine in an adult 2 tablets (1/200th grain each) taken one hour before going to sea, followed by 1 tablet every six hours for forty-eight hours is recommended It is fair to state that Hyoscine does not prevent or delay adaptation to the ship's motion but it is also true that if this has not occurred after forty eight hours of rough weather then it is unlikely ever to do so

It will be noted that the regime recommended above is similar to but somewhat lighter than, the one recommended by the R N P R C for survival at sea in life rafts The trials on *Tyne* of the latter regime revealed no limiting side-effects in fact, but the difference between sitting in a life-craft on the one hand, and carrying out normal ship-board duties on the other has to be taken into account when prescribing Hyoscine in forty-eight hour dosage

If in any one individual Hyoscine fails to prevent seasickness Avomine should next be tried, and other drugs such as Marzine (cyclizine hydrochloride) might well be tried before Ancolan Marzine can be bought without prescription in this country as can Kwells though dosage of only two 1/200 grain tablets of the latter can be advised by its makers (E Griffiths Hughes Limited) without breaching the Scheduled Drugs Act

Acknowledgments

Our thanks are due to May and Baker Limited for supply of the capsules of Avomine Largactil, Hyoscine and Placebo, and to British Drug Houses Limited for those containing Ancolan

Also to Surgeon Commander J W L Crosfill R N (Rtd) and Dr G R Hervey of the Department of Experimental Medicine Cambridge for their help and advice Likewise the Commanding Officers, medical and sick berth staff and ships' companies of H M Ships *Osprey* *Tyne* and *Dundas* for their co-operation and Mr A A Heron of *Osprey* for the audiometric figures

REFERENCES

CHINN H T CONE T E Jnr HANDFORD S W and SMITH P K (1954) *Jnl of Pharm Therapeutics* **111** 4 447

—— NOELL W K and SMITH P K (1950) *Arch Int Med* 86 810

GLASER E M (1953) *Br Jnl of Pharm* 8, 187

—— and HERVEY G R (1951) *Lancet* 2 749 (1952) **1** 490

HOLLING H E McARDLE B and TROTTER W R (1944) *Lancet* **1**, 127

DE WIT G (1953) Seasickness *Acta Otolaryngologica Suppl* 108

THE ROYAL NAVY MEDICAL CLUB DINNER, 1958

THE annual dinner of the Royal Navy Medical Club was held at the Royal Naval College, Greenwich on 25th April 1958

This year the total number of members and guests was 241 and applications were so numerous that places had to be the result of a ballot

The Medical Director-General Surgeon Vice-Admiral Sir Cyril May presided and the principal guest was Vice-Admiral D E Holland Martin Second Sea Lord In addition to the Directors General of the Army and Royal Air Force Medical and Dental Services the official guests included the Chaplain of the Fleet Vice-Admiral Sir Geoffrey Barnard Admiral President of the R N College and Sir James Patterson Ross President of the Royal College of Surgeons

Members who attended included the Lord Evans Sir Harold Gillies Sir Harold Graham Hodgson Professor R F Woolmer and a large number of civil consultants

This year following the sensible resolution of the committee, the speeches were restricted to two only so that those attending might have a longer time in which to renew old acquaintances

In proposing the toast of "The Guests" the Medical Director-General delivered an admirable speech which was both informative and highly entertaining to his audience There was no doubt in the minds of the critics, many of whom could refer to numerous past dinners with authority that Admiral May's address was not merely the "highlight of the evening," but also the best speech by a Medical Director-General for many years past

Replying for "The Guests" Admiral Holland Martin more than held his own against the doctors who he did not think had changed much since he first underwent medical examination at their hands for entry into the Navy His anecdote which dealt with "The motion of the ocean" was indeed a delight

During the evening, it was announced that the R N Medical Club would hold a Cocktail Party, later in the year which would be attended by members and their ladies

THE PASSING OF THE ROYAL NAVAL HOSPITAL, GREAT YARMOUTH

In accordance with the Yarmouth Hospital Transfer Act 1957, the Royal Naval Hospital, Great Yarmouth, was transferred to the Ministry of Health at midnight on 31st March, 1958, thereby severing the link between Great Yarmouth and the Royal Navy which has existed for over a hundred years

The hospital was originally built by the Admiralty, at a cost of £120,000 between 1809 and 1811, to receive casualties in the war with France The foundation stone was actually laid in 1809 by Admiral Billie Douglas, Port Admiral of Yarmouth The architect was a Mr Pilkington and the builder was Henry Peto It was so used until after the battle of Waterloo, and both naval and military casualties of Waterloo are buried in the hospital square, with a plaque to commemorate this event

After Waterloo, the hospital was converted into an Army barracks The first Barrack Master was George William Manby, celebrated for his invention of the rocket life saving apparatus which he developed after witnessing a shipwreck off the coast of Yarmouth.

In 1844, the building became a military lunatic asylum, but in 1854, on the outbreak of war with Russia the Admiralty claimed it back, and it was

fitted out for the treatment of naval sick and wounded from Sir Charles Napier's Baltic fleet

In 1858 the Admiralty loaned the building to the War Office for use as a convalescent hospital for casualties from the Indian Mutiny, and a number of wounded from Lucknow and Cawnpore came under the care of Captain Jarvis who was then Medical Officer-in-Charge

In 1863 the Admiralty regained possession of the hospital and at the same time the 20 acres of land between the hospital and the sea were purchased from the Borough for the sum of £10 000 the Admiralty giving the undertaking that this ground would not be used for buildings but only for purposes of recreation It is of interest, that immediately before the effective date of the present transfer to the Ministry of Health this land, originally sand dunes but now representing a considerable sea frontage of a popular holiday resort was conveyed back to the local corporation

From 1863 onwards the Admiralty used the hospital for the accommodation of patients suffering from chronic mental disorders

In 1930 following the introduction of the Mental Treatment Act, some doubt arose on the point of whether this Act gave the Admiralty authority to detain mental patients The matter was settled by the passage of the Yarmouth Hospital Act 1931 after which the hospital continued to exist under the authority of its own statute This statute has been repealed by the present Yarmouth Hospital Transfer Act

During the Second World War the hospital was evacuated to Lancaster and the buildings became H M S *Watchful* the naval headquarters at Great Yarmouth After the war patients and staff returned and it became customary to admit patients from the Army and R A F as well as those from the Navy

Externally the hospital has changed little in appearance during the years since it was first built. But internally, modernization has taken place so that patients can enjoy such amenities as television up-to-date furnishings and contemporary decorations all of which, nowadays, play so important a part among the therapeutic measures for dealing with mental diseases

At the time of the transfer to the Ministry, the hospital accommodated 151 patients The majority of these had been cared for since the First World War, but the oldest inhabitant had been a patient in the hospital since 1904

On the effective date of the transfer, the hospital was re-named St Nicholas Hospital Great Yarmouth and became a unit in No 7 Group of the East Anglian Regional Hospital Board Through the medium of this transfer the Regional Board will gain 236 new beds for mental patients for whom there is an acute shortage of accommodation in East Anglia

As a condition of the transfer the whole of the hospital staff was taken over by the Regional Hospital Board, and it is a matter of great satisfaction to both the Admiralty and to the Ministry of Health, that the transfer has been effected without causing unemployment in the case of any individual

Prior to the transfer of the hospital, the Medical Officer-in-Charge,

accompanied by the Secretary and the Chief Male Nurse, paid an official call on Her Worship the Mayor of Great Yarmouth and handed her a letter from Sir John Lang the Permanent Secretary of the Admiralty This read "Madame I am commanded by my Lords Commissioners of the Admiralty in connexion with the forthcoming transfer of the Royal Naval Hospital, Great Yarmouth, to the Ministry of Health to express to you their Lordships' regret that the long association of the Naval Service with the Town and County Borough of Great Yarmouth which the existence of the Royal Naval Hospital has marked over the last century is to be brought to a close

My Lords are aware of the interest which the civic authorities have exhibited in the Royal Naval Hospital and have noted with appreciation the excellent relations which have been so happy a feature of the long connexion of the hospital and the town

My Lords wish me to say that although they regret that the most direct link between the town and the Naval Service will by the transfer of the hospital be severed yet they are sure that the connexions between Great Yarmouth and the Royal Navy will continue to be close and most cordial, exemplified in the visits made from time to time by certain of H M Ships, and based upon a common interest and concern with all things maritime "

In addition the Mayor was presented with a gift from the hospital itself to the town This took the form of a silver ash tray, set in a miniature ship's wheel just under one foot in diameter and round the circumference of which were inscribed on a silver band the words Presented by the Royal Naval Hospital in gratitude for the many favours received from the Borough of Great Yarmouth 1863–1958 In reply Her Worship said that she was most touched by the gift, because it was a long time to have been hosts to people who had need of care There had been very friendly relations between the town and the hospital Deeply as the town regretted this severence of a link with the past the Navy would never be forgotten "During the war you were lost to us for a while" said the Mayor, "but still you came back and I am delighted to know that you will continue to be with us though under a different note heading But that will make no difference to you because your lives of service will go on "

Reviews

THE NURSE AND THE DIABETIC By Joan B Walker M D M R C S L R C P Medical Officer-in-Charge of the Diabetic Department Leicester Royal Infirmary First Edition 1958 Pp 128 fully illustrated Published for Nursing Mirror by Iliffe and Sons Limited London Price 10s. 6d (By post 11s 2d)

The book The Nurse and the Diabetic by Joan B Walker M D M R C S L R C P., is most comprehensive dealing as it does with the nature of the disease right through to the rehabilitation of the patient

Every occasion pertaining to observation and nursing of this many facet sided disease is dealt with clearly and consecutively In both instances treatment of diabetics in hospital and in their own homes is lucidly and sympathetically explained

The classified detail of this book can only have evolved from work, study and human interest served to the benefit of people suffering from diabetes

Every nurse should enlighten her knowledge on medical nursing by reading such a well-constructed book.

MODERN TREATMENT YEARBOOK 1958. Edited by Sir Cecil Wakeley Bt *K B E., C B.* Pp xii + 312 with plates and illustrations. London Baillière Tindall and Cox Limited Price 27s 6d

Another of these by now well known Year Books' makes its appearance It covers advances in diagnosis and treatment of common conditions in medicine surgery and obstetrics It is edited by Sir Cecil Wakeley and contains thirty one articles designed to bring the general practitioner abreast of the nowadays ever changing face of medicine

From a wide variety of expert articles it is invidious to pick and choose but that on investigation of diarrhoea will be of particular value and interest to the Service Medical Officer and a dissertation on dyspnoea is excellent as is also the chapter on trigeminal neuralgia and facial pain Another extremely useful article is on chronic bronchitis though here it is surprising to find no mention of smoking aetiologically or of its prohibition therapeutically

The book is most readable and can be thoroughly recommended

E D C

ARMY MEDICAL SERVICES VOLUME II CAMPAIGNS. By Professor F A E. Crew F R S First Edition 1957 Pp xxxvii + 537 London H M Stationery Office. Price 84s 0d net

In this the second volume (Campaigns) of the activities of the Army Medical Services, to the Second World War Professor Crew has again provided us with a thrilling narrative The period covered extends to the end of 1943 and the outstanding feature of the volume is the long and detailed account of the campaigns in North Africa over the period The description of medical cover for the Army in action from the Alamein Line up to the final offensive in Tunisia gives the reader a deep insight into the problems of medical administration which have to be catered for during all phases of planning The pathological and transfusion services alone are worthy of attention and the chapter which deals with the Army psychiatric service is most instructive

Naval readers will fully appreciate the account of the defence and fall of Hong Kong as well as that of Malaya and Singapore. As in the case of our own Service the author has taken great pains in sifting out the vast number of reports of men who contrived to maintain chronicles of the events in which they were involved during long years of captivity.

Professor Crew has again fulfilled a difficult task with marked success, and the students of Medical History will await his third volume with great anticipation.

J. L. S. C.

AIDS TO MEDICAL DIAGNOSIS. By G. E. Frederick Sutton, *M.C.*, M.D. Lond., F.R.C.P. Consultant Physician United Bristol Hospitals. Eighth Edition. 1958. Pp. viii + 400 with illustrations. London: Baillière, Tindall and Cox. Price 12s. 6d.

The new edition of this excellent book lives up to its past reputation and to the others of the series. There has been thorough revision and it is recommended as a useful book to have around. It is a delight to dip into as the "Aid" it calls itself. I was most impressed with the lucid examples of Electrocardiograms which will be invaluable to the student and to the practitioner not constantly conversant with their interpretation.

D. G. D.

LEPTOSPIROSIS. By J. M. Alston, M.D., F.R.C.P. Edin., of Whittington Hospital London, and J. C. Broom, *O.B.E.*, M.D., The Wellcome Laboratories of Tropical Medicine London. With a foreword by Sir Samuel Bedson M.D., D.Sc., F.R.C.P., F.R.S., Consulting Adviser in Pathology to the Ministry of Health. First Edition. 1958. Pp. xii + 367 with 34 plates. London and Edinburgh: E. & S. Livingstone Ltd. Price 40s. 0d.

Described by Landouzy in 1883 and associated with sewer work, established as a separate entity by Weil three years later, and with its infective organism at last isolated by Inada and certain German groups in 1916, Leptospirosis has come increasingly into the public eye. More than 50 serotypes have now been named, though only 2 are found in the British Isles.

This book is a very comprehensive study of the whole subject, valuable to physician, pathologist and medical officer of health.

Starting with a general survey of the morphology and physiology of Leptospires, there are interesting sections on serological classification and electron micrography with some outstanding illustrations. Detailed chapters follow dealing with the epidemiology, pathology and clinical aspects of Weil's disease.

The authors emphasize that though hepatitis with obstruction to the flow of bile and multiple small hemorrhages due to capillary damage are notable features of severe cases, death more frequently is caused by nephritis with renal changes arising from overall reduction in blood flow caused by vasoconstriction. Mortality in severe cases averages 16 per cent, but this increases with age to 33 per cent. for those over 60. The remainder almost always show complete functional recovery and the carrier stage rarely lasts over four to six weeks from the onset.

Mild Leptospirosis from infection with *L. canicola* has been increasingly diagnosed since first recognition in 1933. But in spite of the high infection rate in dogs and the possibly prolonged carrier state, the low incidence in human beings shows only a mild degree of infectivity for man. Clinically the onset is as sudden as in the other forms but the course differs in producing severe initial headache, less jaundice and more frequent meningeal symptoms.

Conditions due to other serotypes are covered more briefly but with sufficient detail, while the references are very full and complete.

The chapter on clinical and laboratory diagnosis is especially valuable.

Various forms of treatment are discussed though the conclusions are not particularly

encouraging. It is shown that in general neither antibiotics nor antiserum have much effect unless administered in the very early stages and that the most efficacious form of treatment in the probable presence of renal involvement is Bull's regime for anuric uraemia

The chapter on preventive measures includes valuable sections on rodent destruction, improvement of hygiene both in industrial premises and in the field the isolation destruction or vaccination of domestic animals and personal protection and prophylaxis. Active immunization by subcutaneous injection of suspensions of killed Leptospires is shown to have been effective in experiments but is not so far generally adopted It is not clear why this promising method has not been followed up more actively

Finally Leptospirosis as it affects a wide range of animals all over the world is covered with the thoroughness shown throughout while a most interesting consideration of the legal aspects of the contraction of the disease in Britain is contributed by Mr C J A Doughty B A Q C

C P C

BOOKS RECEIVED

ROTATION RADIOGRAPHY By Shinji Takahashi M D Pp ii + 164 with 118 figures and 19 tables March 1957 Published by the Japan Society for the Promotion of Science

THE POWER TO LOVE By Edwin W Hirsch M D Pp xix + 298 London Souvenir Press Limited Price 25s 0d

We acknowledge with thanks receipt of the following publications

Acta Medica et Biologica Annals of Tropical Medicine and Parasitology British Medical Bulletin British Medical Journal Bulletin of the World Health Organization Chronicle of the World Health Organization Fukushima Journal of Medical Science Guy's Hospital Gazette Journal of the Royal Army Medical Corps Journal of the Royal Naval Scientific Service Kyushu Journal of Medical Science Medical Journal of Osaka University Microscopic Staining Technique No 4 Middlesex Hospital Journal Military Medicine Montreal Medical Nagoya Journal of Medical Science Physiologica Bohemoslovenica Proceedings of the Staff Meetings of the Mayo Clinic Report on the Health of the Army 1954 Revue Internationale Des Services De Santé Rivista Di Medicina Aeronautica St Mary's Hospital Gazette The Australian Journal of Experimental Biology and Medical Science The British Journal of Surgery The Broad Way Westminster Hospital The Journal of the American Medical Association The Journal of the Bowman Gray School of Medicine The Journal of the Irish Medical Association The Kanazawa Medical Journal The Kurume Medical Journal The Medical Press The Tohoku Journal of Experimental Medicine Tropical Diseases Bulletin Yokohama Medical Bulletin

News of the Service

OBITUARY

Surgeon Captain W S H SEQUEIRA R.N (Rtd.) died on the 11th April, 1958 Born on the 24th June, 1869, he qualified M.R.C S Eng and L R C P Lond in 1893 (M.B in 1894) and entered the Royal Navy as a Surgeon in 1896 Promoted Staff Surgeon in 1904 and Surgeon Commander in 1910 he was placed on the Retired List at his own request on the 15th September 1921 with the rank of Surgeon Captain

During World War I Surgeon Captain Sequeira served in H M Ships *Tyne Cochrane* and *Iron Duke*

Surgeon Commander G T VERRY R N (Rtd.) died on the 4th April 1958 Born on the 5th November 1880 he qualified M R C S Eng and L R C P Lond in 1906 and entered the Royal Navy as a Surgeon in 1908 Promoted Surgeon Lieutenant-Commander in 1915 and Surgeon Commander in 1919, he was placed on the Retired List at his own request on the 1st February 1926

During World War I Surgeon Commander Verry served at Cape Hospital and in H M Ship *Southampton*

HONOURS AND AWARDS

The Medical Director-General of the Royal Australian Navy Surgeon Rear Admiral I Lockwood *C B E M V O D S C Q H S.* has been elected a Fellow of the Royal Australasian College of Physicians for services to medicine.

Companion of the Order of the Bath

Surgeon Rear Admiral R L G Proctor

Gilbert Blane Medal

The Gilbert Blane medal for the year 1958 has been awarded to Surgeon Commander W E Crocker R N

HIGHER DEGREES

F R C P—Surgeon Captain M A Rugg Gunn R N
F R C S—Surgeon Commander G Hayes, R N
D R C O G—Surgeon Lieutenant D H Elliott, R N
D A—Surgeon Lieutenants G Cartmel R N J R Lawrance-Owen R N
D P H—Surgeon Lieutenant Commander W R Davies R N

PROMOTIONS

To Surgeon Lieutenant Commander—T M M Conway (12 3 58) P F Toal (20 5 58) G A R Girn (21 3 58)
To Surgeon Lieutenant-Commander (D)—J T Saunders (26 4 58)

The following provisional selections have been announced for promotion to date 31st December 1958

To Surgeon Captain—P K Fraser D P Gurd B S Lewis *D S C*, G D Wedd *O B E.*
To Surgeon Commander—T C Barras J M Cliff J Keeling F A F Mackenzie
To Surgeon Captain (D)—S R Wallis
To Surgeon Commander (D)—G K Wray

ROYAL NAVAL VOLUNTEER RESERVE (30TH JUNE 1958)

To Surgeon Captain—P De B Turtle *V R D and Clasp*
To Surgeon Commander—C F Cooper D C Lillie W P Small

ROYAL CANADIAN NAVY (RESERVE) (30TH JUNE 1958)

To Surgeon Captain—J W A Duckworth C M Harlow

TRANSFERS TO PERMANENT LIST

Surgeon Lieutenants—T L Fallowfield T T Phillips H G Scott J M Young

ENTRIES FOR SHORT SERVICE COMMISSION

D C Beckingham B M B Ch H Bodsworth M B Ch B R J Carmichael M B Ch B R B Fountain M B B S J O Knowles M R C S L R C P J G Noble M B Ch B J Shaw M B B Ch I R Thornber M R C S L R C P J D Wrighton M B B S D R C O G B R Bowles L D S H D Glenwright B D S W J Gregory L D S D C Shelley L D S

RE-ENTRIES FOR SHORT SERVICE COMMISSION

N J Blacklock M B Ch B F R C S

RETIREMENTS

Surgeon Rear Admiral D Duncan *C B O B E*
Surgeon Captain T B Lynagh R N
Surgeon Commanders—J W Caswell R N T A Turnbull R N
Surgeon Lieutenant-Commander S D Walsh, R N
Surgeon Lieutenant R M Butler R N
Surgeon Lieutenant (D) G R Jones R N

APPOINTMENTS IN THE NAVAL RECRUITING SERVICE

(Final Medical Examining Officer)

Headquarters Recruiting Office Southampton—Surgeon Captain J V Williams R N (Rtd) 1st April 1958 vice Surgeon Captain Murray R N (Rtd)

WARDMASTER OFFICERS

HONOURS AND AWARDS

Member of the British Empire

Wardmaster Lieutenant Commander D C Jenkins

British Empire Medal

S B C P O D W Garrod C/MX 49372 S B C P O J Poulton C/MX 48843

PROMOTIONS

To Wardmaster Lieutenant-Commander—W Jones (1 4 58)
To Wardmaster Lieutenant—H Burton *D S M* (1 4 58) K H Laws (1 4 58)
To Acting Wardmaster Sub-Lieutenant—F Gay (20 6 58) D J L Vaughan (20 5 58)

RETIREMENTS

Wardmaster Lieutenant-Commander C F Weeks *B E M*
Wardmaster Lieutenant T A Morgan

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

HONOURS AND AWARDS

Commander of the British Empire

Miss Barbara Nockolds *R R C* *Q H N S* Matron-in Chief

Royal Red Cross

Miss N M Willoughby *A R R C* Principal Matron

Associate of the Royal Red Cross

Miss N H Glew Superintending Sister

PROMOTIONS

To Senior Nursing Sister—Miss R H Fordyce Miss D J Loughman Miss M Mitchell

ENTRIES FOR SHORT SERVICE COMMISSION

Miss R Colmans Nursing Sister

TRANSFERS TO SHORT SERVICE COMMISSION

Miss F Andrews Miss P R Hemnell Miss K J Hitch Miss M F Jack Miss E M Northway

ADMIRALTY FLEET ORDERS—1958

(This page is perforated for filing)

Notices

Abstract of The Treatment of Amebic Proctitis with Tetracycline-Nystatin By Jose Ruiloba Gerardo de Esesarte and Manuel J Fierro Hospital de Enfermedades de la Nutricion Mexico City Mexico Antibiotics Annual 1957 1958 New York Medical Encyclopedia Inc., 1958 p 456

Treatment of a group of 15 amebiasis patients with a combination of tetracycline nystatin[1] (broad spectrum antibiotic and antifungal agent) resulted in the cure of 13 in a cure rate of 86 6 per cent 2 cases in which this treatment was unsuccessful were cured by use of an arsenical and another antibiotic. 13 of the 15 patients had proctitis 1 had rectal granuloma and another pelvirectal abscess The typical dysenteric syndrome was apparent in 14 Diagnosis was made in every case by rectosigmoidoscopic examination Trophozoites of *E histolytica* were identified by direct examination by stain and culture Prior to this study at least 10 of the 15 had been unsuccessfully treated with arsenicals oxyquinolones, emetine and other compounds One of the patients had suffered from dysentery for seven years Treatment of the entire group (with one exception) consisted of a combination of 250 mg tetracycline and 250 000 units nystatin administered orally every six hours for a period ranging from six to ten days Clinical improvement was evident in most cases by the second day By the fifth day characteristic ulcers had disappeared or markedly improved and trophozoites of *E histolytica* were absent in the majority of instances The case of seven years standing received tetracycline-nystatin for four weeks and was considered cured on re-examination three months later A total of 13 patients were cured clinically and parasitologically On the basis of their experience the authors conclude that this combination of antibiotics (tetracycline-nystatin) has proved highly effective in the treatment of amebic dysentery

[1] Available commercially as Mysteclin

BRITISH STANDARD FOR SCALPELS WITH DETACHABLE BLADES (B S 2982 1958)

Although scalpels with detachable blades have become well established in use it has been found that slight differences in the dimensions of the fittings by which blades are attached to handles made by different manufacturers may give rise to difficult or inadequate location of the components The primary purpose of this standard—prepared at the request of the Ministry of Health following representations by a number of surgeons—is to ensure that reasonable limits are maintained for such fittings so that blades and handles of differing manufacture give a satisfactory grip and the design provides balance and efficiency in use.

The various shapes and sizes of blades have not been specified since they may be open to considerable variation according to the many uses to which such equipment is put

British Standard 2982 may be obtained from the Sales Branch of the British Standards Institution 2 Park Street London W 1 Price 3s 0d (Postage is charged to non subscribers.)

AN INEXPENSIVE BRITISH MICROFILM READER

One of the most pressing needs at the moment in the field of micro-recording is for an inexpensive microfilm reader which will also scan microfiche. This need is now met by the V C Lexicon Reader manufactured by Micro Methods Limited of East Ardsley Yorkshire. Costing only £44 it will read microfiche up to a maximum size of 9 cm wide and can be fitted with a film carrier to take 100 ft of full-size 35 mm unperforated microfilm. It is a compact machine which takes up when not in use a volume of only 15 in × by 10 in × 11 in. In order to secure the advantage of complete portability the weight has been kept down to 25 lb.

The film carrier for microfilm scanning can be removed and refitted very quickly and easily which facilitates film threading. Transport of the film across the gate is effected by a handle mounted on the carrier and the image remains in focus whether the film is moving or not. A tensioning arrangement eliminates the need for pressure plates and thus prevents accidental scratching. The fiche image is projected on to a white opaque screen on the desk and is approximately 15 in square. A prism attachment is available which enables the image to be projected by finger control on to the screen at any desired reading angle. Magnification is 16 with a gate size of 2·4 cm × 2·4 cm. The equipment can be set for use with a wide range of A C voltages and can be converted to D C by special resistances.

Microfilm and microfiche scanning are not the only attributes of this versatile item of equipment. It can also be used as a filmstrip or slide projector. The whole Reader can be swung into position for horizontal projection with filmstrips fed through the film carrier or slides held in the standard microfiche attachment.

This new equipment will be welcomed by those libraries and research workers who have learnt how far micro recording can provide a guarantee against loss or destruction of documents and reduce bulky material to a small and convenient filing system. Its cheapness—the basic Reader costs only £44 the fact that it is so designed that the manufacturers can incorporate further refinements—in the form of other special attachments—as the demand arises for these its present capacity for use as microfiche reader or filmstrip and slide projector as required all these factors make this new microfilm reader a most welcome addition to the librarian's shopping list.

Notice

The Editor invites medical officers to send in original papers on professional subjects, travel, personal experiences, &c. Items of news and matters of interest to the naval medical service will be welcomed from ships and establishments on home and foreign stations. Notices of births, marriages and deaths are inserted free of charge to subscribers.

All articles or communications published in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE will become the property of the Journal with full copyright powers, unless the author declares when sending in the article that he desires to reserve the copyright to himself.

The Harvard system should be employed for bibliographical references, these references being arranged in alphabetical order of the authors' names at the end of the contribution, thus: "Smith, F. G. (1935) *J. roy. nav. med. Serv.*, **22**, 53." In the text a reference to a publication should be cited by giving the author and in brackets the date, thus: "Smith (1935) believed this to be due, &c."

The Journal is published quarterly, four numbers comprising one volume.

Articles and communications may be sent to the Editor at any time. They should be clearly written or, preferably, typed and sent in duplicate to The Editor, R.N. Medical School, Alverstoke, Hants.

Subscriptions

For R.N. and R.N.V.R. medical personnel on the active or retired list, and for Consultants to the Royal Navy, the subscription is 20s. per annum (postage included) payable on 1st January of each year. Single copies 5s.

For dental officers in the above categories the subscription is 10s. per annum (postage included). Single copies 5s.

For all others who are *not* in the above categories the subscription is 24s. per annum (postage included), or 6s. per single copy.

Cheques and postal orders should be crossed "Lloyds Bank Ltd." and made payable to the Editor, The Journal of the R.N. Medical Service.

The payment of subscriptions by banker's order is recommended as it relieves the subscriber of the necessity of forwarding a cheque each year and simplifies the keeping of accounts.

All Applications for Advertisements to be made to

THE EDITOR,
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R.N. Medical School, Alverstoke, Hants.

VOLUME XLIV AUTUMN 1958 No. 4

Journal of the Royal Naval Medical Service

Editorial

TRIBUTE TO A CENTENARIAN

As announced elsewhere in this issue Surgeon Rear-Admiral J. J. Dennis *C.B.* died recently.

Unfortunately, in the course of Nature death is not uncommon among retired Naval Medical Officers. Even more unfortunately, it is not unknown among their brethren on the Active List. But the remarkable fact is that the late Admiral Dennis lived to be 100 years old, an achievement which few of us can hope to equal.

In these days, when so many of their colleagues have the habit of dying in harness, few doctors, on reaching the age of only 50, can be wholly free of an occasional twinge of anxiety about their personal expectation of life. To the stress and strain of a modern medical existence are added the tortures of traffic and taxation, to the nightmare necessity of providing for declining years and dependants are added fears and phobias about physical well-being which, if we speak the truth, are probably suffered by us all. Even in his moments of so-called relaxation, when he attempts to study current literature at his ease, the poor quinquagenarian doctor finds himself reminded of the carcinogenic properties of the cigarette which he is smoking. Turning the pages quickly, his eyes become focused on the subject of serum cholesterol, so that we can hardly blame him if, when his reading is accompanied by a painful post-prandial eructation, he asks himself "Is that the cucumber I ate for supper or is my coronary coming at last?" It is, therefore, cheering news to read that a doctor, and a naval one too, who was already aged 50 at a time when the rest of us were toddlers, then went on to complete his century.

But what we should all like to know is how the gallant Admiral did it! What was his secret? Did he avoid processed foods? Did he eat eggs laid only by chickens reared on sun-flower seed? Did he eat raw beetroot? Did he smoke? Did he drink? If so, how much or how little?

Unfortunately, although our records tell us much about the thirty eight years of the Admiral's distinguished Service career, we have no knowledge of

him during his later years. Perhaps this is as well, because our very ignorance of the officer's activities in retirement permits us to paint for ourselves our own attractive picture of him. Certain of his characteristics we can probably conjecture with a fair degree of accuracy. For instance, we feel that the Admiral must surely have possessed a great sense of humour. Who wouldn't, after drawing his pension from the Crown for some forty years? Also, we like to imagine that as others died while he survived, the Admiral developed a highly competitive spirit as the years passed. We like to visualize him, aged 95, eagerly studying the obituary columns of *The Times* and noting, with a mixture of sorrow, and secret satisfaction, the demise of young fellows aged a mere 70 or 80. We trust we may be forgiven if we suggest that this courageous old warrior might even have chuckled at such a time, while muttering to himself in true Shavian fashion:

"Poor Snooks.
How simply frightful!
How delightful!"

Yet, we are still only wandering in the realm of fantasy in our search for the late Admiral Dennis's elixir of life. What do we learn from the few facts at our disposal? We fear very little which is likely to help, apart from three simple words which we take the liberty of quoting from the obituary notices of other periodicals—"He was unmarried."

Has this statement any statistical significance? This is a question which we are not prepared to answer. Nevertheless, we do venture to suggest that this solitary factor in the long life of our deceased and respected colleague may prove of great encouragement to at least two of our very Senior Medical Officers who, happily, are still serving.

Articles

EMERGENCY TRANSFUSION IN WAR AND PEACE

BY

Surgeon Rear-Admiral S. G. RAINSFORD

The very title of this paper necessarily poses two distinct yet interdependent problems, but of the two that which concerns peace is by far the more difficult and more important. More important because what can be done on the outbreak of war will to a great extent depend upon the type of organization established during times of peace.

The advent of nuclear weapons and napalm bombs, when the majority of casualties will be due to burns, has made it a practical certainty that in any future war reliance will have to be largely placed on the use of a blood substitute such as Dextran rather than on blood or blood products for the prevention of surgical shock. Therefore in planning any National Blood Transfusion Service this fact should be kept in mind.

Nevertheless when blood is essential to save life there is at present no substitute and for this reason every country of the world must, sooner or later give serious consideration to the establishment of some kind of National Blood Transfusion Service.

In planning such a Service many factors must be taken into consideration for what might be suitable for one country may be quite impractical or even unjustifiable and possibly even dangerous in another.

The more important factors to be considered are:

(*a*) The distribution of the population, i.e. is it concentrated or widely dispersed?

(*b*) Communications (difficult or easy).

(*c*) Climate (hot, cool or cold).

(*d*) Availability of trained technicians and skilled personnel.

For example the type of organization suitable for a small densely populated island like the United Kingdom with its comparatively cool climate and its

excellent communications, would be quite unsuitable and impracticable for a large continental country like India or Africa where the relatively hot climate and enormous population, the majority of which is distributed over a huge area, would produce many great difficulties in the collection, the distribution and the storage of blood or blood products.

In planning any kind of National organization for the treatment of surgical shock we have, for all practical purposes, a choice of three agents, namely blood, blood plasma, or Dextran. Let us therefore consider these three therapeutic agents separately.

Blood

Blood is potentially highly dangerous, highly perishable and a very expensive therapeutic agent.

It is dangerous because it can be incompatible in the matter of its blood groups. It can be infected with bacteria and even when collected under completely aseptic conditions it can transmit such diseases from donor to patient as malaria, hepatitis, and perhaps other protozoal diseases or even smallpox.

In warm climates the greatest danger, however, must be that of bacterial infection. It is almost impossible, even under good conditions, to collect a bottle of blood in a manner by which it can be certain that it will be completely sterile. The only factor that makes blood at all safe in this respect is refrigeration, i.e. the rapid cooling after collection to a temperature below which the majority of pathogenic bacteria cannot multiply and maintaining it at this temperature under all conditions of storage, transport and distribution until the moment arrives for it to be transfused into the patient. For this reason in hot climates blood should be collected from donors in air-conditioned rooms for the comfort of the donors and to reduce the likelihood of fainting and to protect the blood from infection.

Blood cannot be frozen and must be maintained at a temperature of not less than 2° C. and not more than 4° C. This necessarily imposes a strict and very narrow temperature control, an expensive and difficult thing to attain in any climate where the ambient temperature is high. Furthermore it is now known that some bacteria can and do flourish and multiply in blood even at these low temperatures. Fortunately such occurrences are comparatively rare for in most of these cases the macroscopic appearance of blood so infected has not shown those signs usually associated with infected blood. It is therefore now recommended by Zeitlin that a sample of blood from every bottle should be examined microscopically before being transfused.

It is scarcely necessary to expound upon the danger of incompatible transfusion since this is so widely recognized and so well understood. The multiplicity of blood groups, however, increases daily, chiefly because blood is being more widely and generally transfused. Every person who receives 1 pint of blood becomes a dangerous recipient and a potential source of an

antibody for an as yet undiscovered blood antigen For this reason the more the population has been transfused with blood the greater becomes the likelihood of an incompatible transfusion and therefore the greater the care necessary to prevent such an occurrence

This may have important practical implications

For example the practice of giving O universal donor blood to a patient under conditions of emergency and where facilities for cross matching do not exist might in this manner become seriously prejudiced

This practice, however, saved many lives in the front line during the last world war and even in conditions of peace such a practice, although it should be avoided if at all possible, does become necessary on occasions such as on board ships at sea etc or in primitive communities

It is surely therefore, unjustifiable to administer blood except where blood is essential to save life

Fortunately it is only in cases where the blood loss is considerable i e a loss of more than 1½ litres that it is absolutely necessary to transfuse blood and even then it is not necessary to replace all the blood lost by whole blood alone for other agents may be safely used to replace some of it

In the majority of cases of injury where the hæmorrhage has been controlled by first-aid methods and in the majority of cases of internal hæmorrhage where bleeding has ceased spontaneously because of the accompanying fall in blood pressure it is the loss of blood volume rather than the reduction of the O_2 carrying capacity of the blood that produces shock and death of the patient

There are many people today who have adjusted their cardiovascular system to such an extent that they are carrying out a full day's work with a hæmoglobin of only 50 per cent of the normal but the rapid loss of half the blood volume would certainly be fatal unless rapidly replaced

Here the word rapidly must be emphasized for unless the replacement is carried out quickly the patient may pass into that condition known as irreversible shock It is certainly a truism in this respect to say that a pint in time may save nine and here a pint of Dextran given quickly may be worth many pints of blood if delay is necessary to allow time for the blood to be cross matched or examined microscopically

Blood volume of course may be seriously reduced by other than hæmorrhage, namely by the great loss of plasma as occurs by leakage into the injured area following thermal injuries or by severe dehydration which follows continuous vomiting and diarrhœa, as for example in cholera In such cases the administration of blood is often unnecessary and may in fact be contra-indicated

Where blood is not absolutely necessary for restoring blood volume there is a choice of employing either a blood product, such as plasma, or of using a blood substitute, such as Dextran

Let us now therefore consider these two therapeutic agents

Plasma

(1) It is considered by most doctors to be a natural fluid and therefore might be thought preferable to Dextran. Plasma as processed, however, especially as a dried product is by no means a natural substance. In the first place it is greatly diluted, i.e. 1 part in 3 with acid citrate solution (acid sodium citrate $2\frac{1}{2}$ per cent in 5 per cent glucose solution) approximately 100 c.c. to 200 c.c. of plasma being added.

Secondly this plasma has usually been stored at about 4° C. for a month in contact with the red blood cells before it is separated. It is therefore by no means fresh plasma when it is processed.

(2) It contains in addition to plasma protein such factors as thrombin, fibrinogen, anti hæmophilic globulin, etc., all of which assist blood to coagulate and therefore tend to prevent hæmorrhage. Nevertheless their value in preventing hæmorrhage in the presence of large amounts of citrate and the fact that the plasma is usually so aged when processed must be somewhat problematical.

(3) It contains antibodies. However it is not usually given because of this property and their nature and amount are of course usually unknown. Some antibodies present may actually be harmful such as hæmolysins and leucocidins.

(4) Every batch of plasma must be regarded as potentially icterogenic. This quality of promoting homologous serum jaundice is generally regarded as being due to a virus present in the plasma. Most viruses are best preserved by freezing and drying, the very method used for preserving plasma protein. It is therefore possible that other virus infections could be transmitted by plasma transfusion such as smallpox in countries where this is endemic like India and Africa.

The danger of transmitting homologous serum jaundice by plasma transfusions is said to have been greatly reduced but not abolished by resorting to small plasma pools. This procedure itself, however, may bring about other undesirable qualities (see later). Furthermore, where *large transfusions* of small pool plasma have to be given, i.e. in burn cases, the danger of homologous serum jaundice is still as great as ever.

(5) Plasma recovered from stored blood may have and often does have an undesirably high content of potassium. This possibility alone is a contra-indication to its use in many clinical conditions where a transfusion of a blood volume expander is indicated.

(6) The total protein value of plasma is by no means constant and varies as much as 3–6 per cent. from pool to pool.

(7) Its keeping qualities are extremely poor and therefore to be preserved it must be dried and bottled *in vacuo* or under dry nitrogen. Even as such it is by no means stable and it is considered to have a life of not more than three years.

The fact that it has to be dried and another bottle of fluid, usually 5 per

cent Dextrose solution, supplied with it for its reconstitution before use raises many problems for the Armed Forces in the field, i.e. Army, Navy or Air Force where transport and storage space are extremely limited and at a premium In addition there is the problem that it can never be decided whether the material is fit for use until after the emergency requiring it has arisen

(8) Dried plasma requires special conditions of storage for it must be kept cool and protected from sunlight Conditions which may be difficult in some countries

(9) Small pool plasma, owing to the method by which it is processed, may possess undesirable qualities not usually found when large pools are processed

It is neither an economical nor practical proposition to filter small plasma pools Reliance must therefore be placed as far as sterility is concerned on bacteriological tests and low temperature storage until drying is complete Nor is it practical to test each small pool for pyrogens total protein or agglutinin titre as is usual with large pools

(10) Plasma whether liquid or dried, is a very expensive product In the first place it must be separated and processed in a cold room, i.e. at a temperature of about 2°–4° C an expensive item itself

It must be subjected to the most rigid bacteriological tests after separation and even when the blood and plasma is separated and manipulated under these special and expensive conditions the wastage due to bacteriological contamination is extremely high

DEXTRAN

(1) Although not a natural fluid it is (in all probability) completely broken down in the body to glucose, or is excreted

(2) It will maintain the collagen pressure of the blood quite as well as plasma protein for at least twenty-four hours

(3) It has no buffering capacity

(4) It contains no coagulation promotion factors

(5) It is however, extremely stable and will keep for years under almost any conditions of storage

(6) Its consistency is known and constant

(7) It is immediately available for use and does not require to be manipulated in any way before being administered

(8) It requires half the storage space and transport required for dried plasma and its reconstituting fluid It can, therefore, be stockpiled more easily and with more confidence than plasma

(9) It is apyrogenic

(10) It can be produced rapidly in unlimited quantities in times of emergency.

(11) It is much cheaper to produce than plasma and is without its dangers

(12) It has been proved to be a satisfactory blood volume expander by the use of huge quantities over a long period

(*a*) More than 500,000 bottles used in Sweden since 1946 For many years usage has been constant at over 45 000 bottles per annum

(*b*) Regularly used in Holland since 1950

(*c*) Approximately 500,000 bottles used in Great Britain since 1949

It will be seen therefore that in continental countries with a continental climate such as for example India the use of blood and blood products bristles with difficulties and dangers and will be very expensive

For blood must be collected under cool conditions and if it is to be stored with safety in close proximity to the refrigerator

If it is to be processed or manipulated in any way this must be done in a cold room at a temperature of not more than 4° C and not less than 2° C

If blood or blood products have to be distributed this must be done in heavy thermally insulated containers which because of weight and space will render transport by rail, road or air more difficult

It can be transfused without the dangers attached to blood products which should be retained for those special cases who require human protein in some form For example the hypoproteinæmias who will require plasma protein the afibrinogenopenias who require fibrinogen the purpuras who require platelets, the hæmophiliacs who require anti-hæmophilic globulin and those cases that require thrombin prothrombin or even gamma globulin

Most of these materials however must be processed from fresh blood The plasma obtained from time-expired blood from the bank is usually poor in most of the labile anti-coagulant factors

Every Blood Transfusion Centre therefore should have the equipment necessary for processing these products from fresh blood The demands, however, for these special products are unlikely to be very great in comparison with the amount of whole blood and Dextran that will be necessary for the treatment of surgical shock.

It is suggested therefore that the concepts upon which a transfusion service should be planned for large continental countries where the climate on the whole is hot should be as follows

(1) The wholesale use of blood should be discouraged and blood should be employed only where blood is essential in order to save life

(2) When a whole blood transfusion is essential fresh blood transfusions should be employed as much as possible rather than use stored blood from a bank Blood keeps indefinitely in the donor and storage costs nothing. Blood in a bottle will keep only a few weeks and storage in a hot climate is very expensive Again it is often easier to transport a donor to the patient than a bottle of blood

(3) As a blood volume expander full reliance can be placed on Dextran and it should be made freely available It can be stored under the cheapest possible conditions It requires no protection from heat or sunlight and is therefore the safest and most economical product to distribute

Banks of Dextran can be laid down at a minimum cost in the most outlandish places where it can be available at a moment's notice

(4) Blood transfusion centres for economical and practical reasons should be confined to the big cities with large concentrated populations where donor panels can be relatively easily organized and established in close proximity to the larger hospitals They should be equipped with air-conditioned rooms where the donors can be bled in comfort and cold rooms where blood can be stored and blood products processed

(5) The greatest economy should be practised in the use of whole blood and blood products both are dangerous and expensive but both may be essential to save life in special cases

Even in severe cases of haemorrhage an early Dextran transfusion will often support a patient until blood has arrived and been cross matched and perhaps microscopically examined before it can be given In this way the danger of a patient passing into a condition of irreversible shock may be prevented and the necessity of giving a very large transfusion of blood avoided

Now let us consider how a service developed upon such principles will stand up to the stresses and strains of modern warfare

The first line of defence against the atom bomb is dispersal of all but key personnel from target areas This of course means the evacuation of the large towns and cities and will of course entail the scattering far and wide of all members of the organized blood donor panels Even therefore if it is possible for the blood transfusion centres to continue to operate donors and therefore blood will be in extremely short supply just at a time when it may be most required

However, the effect of modern weapons, that is the atom bomb and the napalm bomb is such that the great majority of casualties will be from burns requiring transfusion with Dextran rather than blood

Then again the employment of armoured vehicles aircraft carriers and jet planes all using highly inflammable fuel indicates that it is burn casualties on a large scale that must be catered for, rather than those wounded by conventional weapons

Provided that Dextran is already in production it is a comparatively simple operation to boost its supply much easier and quicker to do than to try and increase the supply of blood

If however, Dextran is to be used on a very large scale in war it is essential that the medical and nursing professions should be fully cognisant of its clinical applications and have full confidence in its use

It is important therefore to encourage its use in times of peace in the Health services, the fighting forces and the Civil Defence organisations They must learn to rely upon it for otherwise they will be forced to reorganise the whole of their supply arrangements in war when it is very likely to be the only material freely available for the treatment of surgical shock

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HEAT ILLNESS

BY

Surgeon Commander F P ELLIS, R N.

INCAPACITATION by work at high temperatures is usually preventable, because some or all of the causes—excessive warmth, hard work unsuitable clothing dehydration and anhidrotic conditions of the skin—can either be controlled within acceptable limits or avoided altogether

For many tasks the body is only about 20 per cent mechanically efficient 80 per cent of the energy evolved by metabolism is expended in the form of heat The harder a man works the more heat he must eliminate by convection, radiation or conduction or store so that his body temperature rises But when these paths for heat loss are inadequate, or when the temperature of the air and surroundings exceed the skin temperature so that the direction of heat flow is reversed, he must rely on evaporative cooling This can only take place if he is sweating, if the surrounding air is not saturated and if the vapour pressure of the air is less than the vapour pressure at the surface of his skin Sweat contains salt, and salt and water deprivation will result unless heavy sweat losses are made good

Evaporative cooling and convective cooling or heating depending on whether the air temperature is less or greater than the skin temperature are accelerated by brisk air currents and by wearing the minimum They are retarded by reducing air movement and by increasing the weight coverage, impermeability or numbers of layers of clothing Clothing protects against the absorption of radiant heat from the sun or from indoor surroundings which are warmer than the body, but interference with the evaporation of sweat may offset this beneficial effect Dark clothing absorbs more radiant heat than white clothing The skin, whatever the colour absorbs radiant heat like a black body Shade protects against solar radiation and reduces sweating but it does not interfere with evaporative cooling It became fashionable during World War II to decry the value of the time-honoured sun helmet In most situations it was cumbersome unhelpful and unnecessary, but the experimental evidence and practical experience both support the use of ventilated or insulated headgear with a broad brim when really severe solar radiation must be endured for long periods, as for example on an open bridge in the Red Sea or the Persian Gulf although not everyone will agree with this

Others will dislike wearing this type of headgear even though it may confer some benefit, or it may be inconvenient for the job in hand

A reduced ability to sweat following prickly heat may aggravate fatigue or predispose to acute heat incapacitation, and so may suppression of sweating from other causes Acute sunburn limits the output of sweat and reduces heat tolerance, and the relatively rare deficiencies or absence of sweat glands should not be forgotten There is no evidence that a well-tanned skin protects a man against excessive warmth, but it will help him to work stripped to the waist in the open without becoming acutely sunburnt so that he can gain the benefit of increased evaporative cooling

Lack of acclimatization is important during the first few weeks when a man commences to work in a warm atmosphere, and particularly during the first few days It is not always easy to dissociate the effect of training or of learning to live in a warm climate from acclimatization, and unacclimatized raw recruits are likely to succumb before unacclimatized but well-trained sailors or marines

Any condition which reduces a man's physical fitness for work such as a bout of gastro-enteritis, an excess of alcohol, lack of sleep or operational fatigue increases the likelihood that he will succumb in an excessively warm environment

Incidence

The official records rarely indicate the true incidence of heat illnesses in the Armed Forces, for incapacitation is often a transient affair in healthy adult men, but they do provide a useful guide to the areas where the problem is most serious Marriott (1950) describes how during the Japanese campaign in India during the hot summer of 1942 1 959 men were admitted to Army hospitals suffering from the effects of heat, and 136 died Salt and water deprivation (heat exhaustion) accounted for 1 660 cases and 40 deaths, and overheating from cessation of sweating (heat stroke) for only 299 cases but for 96 deaths

Heat exhaustion was also prominent as a cause of heat incapacitation in the Royal Navy during World War II When a large part of the Fleet was moved from temperate to tropical waters in 1944 for the campaign against the Japanese the case incidence for the combined sick and attending lists as reported in reply to a special questionnaire from the Fleet Medical Officer was 0 42 per 100 man-months—a rate of about 50 per 1,000 per year (Ellis 1948) It is certain that unreported and unrecorded heat illness and a general lowering in working efficiency had a far more serious impact than even this high figure suggests The majority of the victims were men working in the machinery spaces

In those days all cases of incapacitating heat illness were reported in the Medical Officer's Quarterly Journal under 'heat stroke' The incidence during the war years for the Total Naval Force as derived from these Journals, was as follows

	Cases	*Case rate/1,000*	*Deaths*
[illegible]	121	0.91	2
1940	218	0.80	1
1941	529	1.33	2
1942	344	0.66	8
1943	314	0.46	1
1944	575	0.72	6
1945	854	1.10	14

There is little doubt, however that these figures grossly underestimate the true incidence for the healthy young sailor recovers so quickly once he is removed from a hot environment to a cool one and is given a cool drink that on many occasions the medical officer may not even see him, or if he does he is so well on his way to recovery that there is hardly any justification for a report in the Journal

During World War II the total annual admission rate per 1,000 per year in the United States Navy and Marine Corps never exceeded 0.6 whilst in the Army it ranged upwards from 0.6–2.5 and exceeded 20 in the Middle East in 1943 (Ellis 1955) Between 1942 and 1951 the Army incidence for heat exhaustion was approximately ten times that for heat stroke, but deaths due to heat stroke were about five times as numerous as deaths due to heat exhaustion which underlines the need for prompt and correct treatment when the cardinal signs—failure of sweating and polyuria—are followed by a rapidly mounting temperature The peacetime incidence in the United States Army which curiously enough is highest in the training camps, places even greater emphasis on heat exhaustion Out of 2,001 cases of heat illness reported from 9 camps in 1954 there were only 20 cases of heat stroke with one death The others were all due to heat exhaustion (Cook 1955)

It is notable that anhidrotic heat exhaustion'—the syndrome of 'physical and mental exhaustion aggravated by exposure to heat and physical exertion, polyuria and frequency of micturition reduction or cessation of sweating except notably on the face and a dry and unusual skin with a preceding history of prickly heat and often unrelated to chloride deficiency'—described by Mole and Horne (1950) and reported earlier from Iraq by Ladell and his colleagues (1944) was not reported in the Navy during the War even from the Eastern Fleet where prickly heat in all its stages was rife at all times Perhaps this was because the condition was not being looked for but scrutiny of a number of carefully documented accounts by conscientious observers which fail to mention it makes it unlikely that this is the whole explanation Although similar conditions have been widely reported elsewhere, it would seem that this is one of the rarer forms of heat illness which is provoked by unusual combinations of climatic conditions and perhaps hard work, which are not usually encountered between-decks in ships It may be that the combination of a very hot humid atmosphere with prolonged exposure to strong sunlight was a precipitating factor on shore On the other hand, perhaps the condition has occurred in ships and has not been recognized

In peacetime acute heat illness is usually encountered less frequently than

in wartime because of the less strenuous operational conditions careful planning of cruises, the smaller peacetime complements the lack of "black out" and damage control restrictions on ventilation and the reduced amount of steaming The case rates per thousand for the incapacitating heat illnesses (N 981 0 to N 981 3 inclusive), listed in earlier years under "heat stroke" for 1954, 1955 and 1956 were only 0 1 0 2 and 0 2 respectively

Whilst these illnesses are primarily encountered in the Navy in war and at sea in warm climates, the main measures to be taken to prevent their occurrence and the loss of efficiency which always accompanies them such as the provision of an acceptable thermal environment adequate numbers of fans and cooled water machines and the maintenance staff to keep them working, must be planned and put into effect in time of peace if they are to be available when hostilities open The Naval Medical Service has an important role to play in drawing attention to situations where unduly warm conditions are affecting health and efficiency adversely, for these problems are nearly always soluble in the design of new construction ships and much can be done to improve unsatisfactory situations in those already built

NOMENCLATURE

The diversity of terms in common usage for describing acute heat illnesses does not assist a clear understanding of this problem Acute heat incapacitation, as it is most frequently observed is due to the cumulative and varied effects of a rising body temperature, salt or water deprivation or both, fatigue and insufficiency of the circulation—caused by peripheral vasodilatation pooling of blood in dependent extremities dehydration or the vasovagal reflex These are straightforward and related manifestations of the body's inability to adapt to an environment which is too warm They should not be regarded as separate clinical entities When partial or complete failure of sweating complicates this relatively simple picture the essential background is the same although the emphasis in management may be different Thus in their wartime study at Shaiba Ladell Waterlow and Hudson (1944) observed that men with uncomplicated salt deficiency dehydration (type I heat exhaustion) heat exhaustion with diminished sweating (type II heat exhaustion) or heat hyperpyrexia were usually salt deficient but whereas the first group were dehydrated, dehydration was not prominent in the men who did not sweat whilst some of the hyperpyrexial cases were probably superhydrated before they lost consciousness

There is much to be said in favour of over simplifying the terminology of the various syndromes seen when men are incapacitated in an excessively warm environment by diagnosing them all—whether comatose hyperpyrexial, salt-deficient dehydrated anhidrotic victims of simple syncope or merely excessively fatigued—as "acute heat incapacitation," and treating each case on its clinical merits as one does with a case of cardiac failure The present instructions are however, that medical officers will adhere to the nomenclature of the International Statistical Classification of the World Health Organization

(1957) when reporting to the Admiralty the cases they encounter on the sick list (Table I)

TABLE I
Heat Illness International Statistical Classification
(Existing List from the Manual of the International Statistical Classification of Diseases Injuries and Causes of Death (1955) 1957 WHO Geneva)

N 981 0	Heat stroke except sunstroke Heat apoplexy heat stroke thermoplegia
N 981 1	Sunstroke Ictus solaris insolation siriasis sunstroke thermic fever
N 981 2	Heat cramps Heat cramps
N 981 3	Heat exhaustion and collapse Heat collapse heat exhaustion heat prostration heat syncope
N 981 4	Sunburn Actinic dermatitis sunburn
714 0	Diseases of sweat glands Anhidrosis, heat rash miliaria rubra prickly heat other diseases of sweat glands.
318 3	Asthenic reaction Asthenic reaction nervous debility nervous exhaustion nervous prostration neurasthenia psychogenic asthenia psychogenic general fatigue
N 981 5	Other Excessive heat heat effects not otherwise specified due to hot weather or overheated places

The need for an improved classification, particularly for use in the Services' Medical Services, has been under consideration for several years by the Medical Research Council's Climatic Physiology Committee as the result of a request forwarded by the Admiralty in 1950 Whilst this Committee recognized the shortcomings of the existing classification which is based on symptomatology rather than on pathological and physiological considerations, for example by the prominent use of the terms "prickly heat" "collapse," "cramps," or "stroke," it was considered that for the sake of continuity these time-honoured terms and the numeral system would have to be perpetuated at least in any initial revision of the International Nomenclature although the need for some new terminology and rearrangement was recognized A draft memorandum proposing the lines on which the current international classification might be revised has been published in the *British Medical Journal*, with the approval of the Climatic Physiology Committee by Dr J S Weiner and Dr G O Horne (1958) as a basis for further consideration pending the next revision of the International Nomenclature (Table II)

This paper by Weiner and Horne, which defines what is meant by the terms they use in an appendix, should be read in the original by those who wish to pursue this matter farther

Certain possible criticisms of the proposals are apparent Some may consider that the distinction between heat hyperpyrexia and heat stroke is artificial and that it should not be necessary to refrain from diagnosing heat hyperpyrexia until a rapidly mounting temperature has exceeded the 106° F mark for "borderline hyperpyrexia" merges into "hyperpyrexia," by this definition, and "hyperpyrexia" into "heat stroke," with loss of consciousness if the heat stress is not removed or countered with prompt cooling, and, loss

TABLE 31

Title	International* Statistical Classification No	Modified No for Processing but not for Publication of Statistics
Heat stroke — Following anhidrosis febrile illness or unqualified	N 981 0	N 981 0
Heat hyperpyrexia — Following anhidrosis febrile illness or unqualified	N 981 5a	N 981 0
Heat cramps	N 981 2	N 981 2
Heat exhaustion	N 981 3a	N 981 3 N 981 7
1 Anhidrotic		
2 Salt deficiency (excluding heat cramps)	N 981 3b	N 981 3 N 981 7
3 Unqualified (including water deficiency, heat exhaustion, exercise induced heat, exhaustion and heat syncope)	N 981 3c	N 981 3
Sunburn	N 981 4	N 981 4
Prickly heat	714 0a	N 981 8
Anhidrosis	714 0b	N 981 9
Heat neurotic reactions (including chronic heat neurotic reaction chronic heat fatigue mild neurotic reaction mild heat fatigue)	318 3a	318 3 (p ut)
Other heat effects (including heat œdema)	N 981 5b	N 981 5

*In accordance with the codes of the Manual of the International Statistical Classification of Diseases Injuries and Causes of Death relating to heat illnesses (1955 1957) WHO Geneva.

of consciousness or even loss of life may occur before the body temperature rises to 106 F [1] For a diagnosis to depend primarily on whether or not a patient loses consciousness or not may seem to be a highly arbitrary approach for clinicians to accept

The new term employed here for the variegated neuro-psychiatric or pseudo psychiatric disorders encountered amongst patients working under continuously warm conditions—the "heat neurotic reactions"—may not be particularly acceptable in Service circles It might be considered unfair to stigmatize a man as neurotic because he has had the misfortune to live and work in an unduly warm environment between decks for many months on end, and, as a result of this, has eventually become more retarded in his work and irritable with his messmates than some of his companions who may have been exposed to these conditions for a very much shorter period, particularly when he recovers, apparently completely, when he returns to a cooler climate on shore or to a more temperate station On the other hand, it is equally unreasonable to blame the psychiatric illness of a man who is psychologically unstable, and to whom the heat is just one more of life's aggravations, primarily on the climate, for the weakness lies in the man rather than in the circumstances in which he has to work, and such individuals should not be exposed to the added stress of work under exacting warm conditions nor should they be sent to the tropics Alternative terms "tropical fatigue" (Macpherson, 1949) or "hot climate fatigue" (Ellis, 1952, 1953), for it also occurs to the north and south of the tropical latitudes, have been suggested for cases falling within the former category For the latter cases the term "tropical" or "hot

climate" neurasthenia, if indeed it is desirable to apply a climatic qualification to a conventional neuro-psychiatric diagnosis, would seem to cover most of the syndromes which are encountered although Cameron (1949) has rightly drawn attention to the fact that a significant proportion of these cases, amounting to 7 per cent in his naval tropical experience, present predominantly psychotic features rather than those of a neurosis

However the new classification does constitute a very useful basis for further consideration and Leithead, Guthrie De La Place and Maegraith (1958) were able to use it in classifying cases encountered during a recent survey of heat illness in Persian Gulf oil tankers Although they commented that cases of heat cramps should be included with the other cases of salt and/or water deficiency under heat exhaustion and were also doubtful of the advisability of accepting an arbitrary body temperature of 106 F for separating casualties from heat hyperpyrexia from those due to other causes

A simplified working classification (Table III) such as that proposed recently by Ladell (1957) has many attractions from a military viewpoint It is entirely consistent with the revision of Weiner and Horne and almost equally consistent with the current classification Ladell's provocative review should be read by all those who are interested in this subject

TABLE III

A	Skin disorders	(1) Sunburn
		(2) Prickly heat
B	Circulatory disorders	(3) Heat syncope
C	Disorders of water and electrolyte metabolism	(4) Heat exhaustion
		(5) Heat cramps
D	Failures of heat regulation	(6) Tropical anhidrotic asthenia
		(7) Hyperpyrexia

To meet the Navy s needs, the writer would prefer to see the uncomplicated skin disorders (A) removed from this list as well as the neurotic conditions The following diagnoses cover most of the requirements of the naval medical officer on shore or afloat in dealing with individuals who are incapacitated by work in warm environments

*I S C No (1957)	
N 981 0	Heat hyperpyrexia (heat stroke)
N 981 3	Heat exhaustion (salt and/or water deficiency states including heat cramps)
N 981 3	Anhidrotic heat exhaustion
N 981 3	Heat syncope (sudden loss of consciousness with changes in posture whilst standing erect for a prolonged period on parade or on entering an excessively warm atmosphere to which one is not accustomed)
N 981 5	Other including heat oedema of the legs
318 3	Hot climate fatigue (excessive fatigue in the absence of notable thermoregulatory failure or of salt or water deficiency)

*I S C (1957)=International Statistical Classification—WHO (1957)

For the time being it is reiterated that the report on the Health of the Navy will be based on the WHO International Statistical Classification 1955 (1957), and medical officers are to adhere to this classification in reporting cases of heat illness If cases of anhidrotic heat exhaustion are observed they should be reported under Serial 981 3 for the present (*not* 714 0) and should be described in detail under "Remarks"

Prevention

Provided young and healthy men are removed promptly from a warm environment to a cool place when they reach the limit of their endurance and their water and salt requirements are met adequately they will recover rapidly If there is delay irreversible changes due to a high body temperature or dehydration may occur in the central nervous system and elsewhere and they may sustain more lasting damage or fatal injury

Control of the thermal factors and work level and the correction of water and salt deficiencies to compensate for heavy sweating when adequate control is not possible will prevent incapacitation in warm environments

Control of the Thermal Environment

It has been said that the effects of working at high temperatures in the tropics are similar to the effects observed on men doing the same kind of work in temperate climates provided men are trained to work in the heat. Thus the same preventive measures probably apply for acclimatized men whatever the geographical situation Those who are unfit older men and men who are overweight may succumb first But even when differences such as these are eliminated and levels of acclimatization and training are ironed out by repeated daily exposures there are still marked differences in individual reactions which will cause one man to collapse in a climate others can tolerate with ease It is thus necessary to apply very considerable safety factors in defining permissible levels of warmth for given working situations

Although there is adequate evidence from the tropics and temperate latitudes that lightly clad young men who are well acclimatized to high temperatures can do light or moderately heavy work for a few hours when the wet-bulb temperature or the effective temperature is 90 F or even higher we cannot ignore Haldane's (1905) classical observations on less highly trained men recorded in England over fifty years ago that in still and warm air continuous hard work becomes impracticable when the wet-bulb temperature exceeds 78° F and that beyond 88 F it becomes impracticable for ordinary persons even to stay for long periods in such air although practice may increase to some extent the limit which can be tolerated Whilst Schickele (1947) reports that deaths due to heat occurred not infrequently in the United States Armed Forces between 1942 and 1944 when the wet-bulb temperature was in the seventies She commented most fatalities associated with heavy exercise occur at relatively low temperatures when the total heat stress is

commonly underestimated." United States Army (1954) and Navy (1954) regulations advise that a weather-eye be kept for casualties when the wet-bulb temperature exceeds 75° F. It is well to remember, however, that in the tropics most acclimatized persons who are appropriately clad will find this an ideally comfortable temperature for light or sedentary activities. The United States Marine Corps (1954) advises caution when the wet bulb temperature exceeds 82° F with an air temperature of 90° F or 75° F with an air temperature of 100° F (each corresponds to a normal effective temperature of about 84° F, when the average air speed is 50/ft./min.).

The most recent United States Department of Defence instruction Technical Bulletin (Medical) 175 (1957) suggests that for assessing the thermal environment out of doors on shore a new index—also devised by Yaglou, who, with Houghten, contrived the "effective temperature" concept thirty years ago—the "WBGT index"—should be computed from the sum of "0.7 stationary wet-bulb temperature (exposed to wind and sun) + 0.2 black globe thermometer temperature (in the sun) + 0.1 dry bulb temperature (in the shade)." It is recommended that when the WBGT Index exceeds 80° F caution is necessary in exercising unseasoned personnel. When the "WBGT" reaches 85° F, strenuous exercises should be suspended in unseasoned personnel during the first two weeks of training, but a reduced scale of training activity is permitted after the second week of training. Outdoor training in the sun is to be avoided when the WBGT exceeds 85° F. All physical training is to be suspended when the WBGT reaches 88° F. On the other hand, hardened personnel after having been acclimatized are permitted to carry on limited activity when the WBGT is between 88–90° F for periods not exceeding six hours a day. This Index has not yet been tested in England, and it has not been compared with Bedford's corrected effective temperature by its American sponsors, which one would expect to give much the same sort of result over the temperature ranges specified in the above recommendations,[1] but it has been fairly thoroughly tested out otherwise during the last three summers at United States Marine Corps training camps in the United States and is now recommended for general use under these conditions by the United States Armed Forces.

In British warships in the tropics the effective temperature (or "corrected" effective temperature if radiant heat is a factor) should be kept below 78° F if possible and should not exceed 86° F. If ventilation and air-cooling arrangements permit warmer conditions than those corresponding to an effective temperature of 86° F, which also correspond approximately to a P4SR value of rather less than 3 (Ellis, 1958, see page 252 of this Journal), for more than an hour or so, reduced efficiency must be accepted, and relatively small additions to the heat load, work load, clothing or duration of exposure, may turn a tolerable situation into one which a man cannot withstand.

[1]It has been confirmed since this paper was written that corrected effective temperature (Bedford, 1946) and the WBGT Index have much the same predictive accuracy (D. Minard, personal communication 15.8.58); if anything the former is rather more accurate, but is less convenient in the field.

Water and Salt Requirements

The amounts different men sweat under the same conditions vary, and so do their water requirements. There is no such thing as a standard water ration except for logistic planning. It has been suggested as a guide that men should be trained to drink enough to produce $1\frac{1}{2}$ pints of urine per day, but at sea in the tropics, some men, particularly those who are unacclimatized, do not excrete as much urine as this, although apparently they remain in reasonable health. Some are probably dehydrated at the subclinical level. But it is also possible that others can adapt somewhat to a lower daily output of urine without suffering any ill effects, although information on this is incomplete.

In very warm atmospheres cool water (70° F.) is more palatable than tepid water, it is more effective in controlling body temperature and men will drink more of it. The amount of cool water which can be taken with comfort is related directly to the amount men sweat, inversely to the amount their body temperatures will rise, and directly to the time for which they can survive very warm conditions. Heavily chlorinated water is less palatable than water which does not taste of chlorine and many men will not drink all they require if water sterilization is overdone. Limited water supplies may be conserved by reducing sweating, by such measures as resting in the shade, avoiding heavy work in the heat of the day, and by wetting clothing with non-potable water, or by drinking small quantities frequently rather than larger amounts at less frequent intervals.

As the salt content of sweat also varies (0.1–0.6 per cent.) the salt requirements of different men differ considerably. A man must learn by experience what he needs. Absent or low chloride in a concentrated urine is a useful early sign of salt deficiency. Too much salt is a bad thing as well as too little and gives rise to malaise, purging and skin rashes. Unless men are sweating continuously or repeatedly they do not require extra salt, and most sedentary workers on shore in the tropics do not need supplements unless they take strenuous exercise. Extra salt in the cooking and on the plate at meal times, coupled with sound propaganda will meet most requirements, and the salt content of bread can be doubled without affecting its palatability. When men are sweating heavily for long periods each day modest supplements to the dietary intake may be necessary, and are particularly advisable when men are incompletely acclimatized. A salt intake of 30 grammes per day[1] is considered not unreasonable for engine-room personnel in the Persian Gulf during the hot summer months, but it is important that the fluid intake should also be generous if the salt intake is increased. In recent experiments at very high temperatures in Singapore a ration of 1 gramme of salt per litre of sweat lost was adequate when acclimatized men worked in a very warm atmosphere for only four hours each day, but it was insufficient when the same experiment was repeated after a four-hour rest. Many people find uncoated salt tablets unpalatable. Reliable preparations of sugar and enteric-coated tablets are

[1]Achieved for the average man by the addition of 3 unheaped teaspoonfuls of salt to the food at table.

tolerated well provided too many are not taken at one time. Salt water (0.1 per cent.) is also acceptable to most people who need it, and is much more acceptable if it is cooled rather than tepid or lukewarm.

The palate is usually a good guide to the amount of salt a person needs. After sweating heavily at a game of golf, squash rackets or football in a warm climate a glass of salt and water can be taken almost with relish, which would be nauseating at other times. But some people dislike salt and never take it if they can avoid it; others are very sparse eaters at sea, especially when the weather is hot or the sea is rough but they still sweat profusely. A sudden bout of diarrhœa and vomiting or unexpectedly strenuous physical effort may disturb the normal electrolyte balance. It is in these circumstances, if the weather suddenly becomes warmer or more humid or the wind falls, that some men will succumb whilst others do not.

The probability is that far more salt is taken by enthusiasts in the Services nowadays than is strictly necessary, but some still do not take enough and one should always be on the lookout for salt depletion, for the symptoms can be insidious and simulate many other minor everyday disorders. Once the diagnosis is suspected the clinical history and the analysis of the urine for reduced chlorides[1] or the use of urine test papers[2] provide ready confirmation.

Water depletion probably occurs more frequently than salt depletion. Acclimatization reduces the concentration of salt in the sweat and although the sweat secretion is increased at the same time the net effect is for the body to conserve salt. It does not conserve water under conditions of heat stress as far as we know. Early acclimatization certainly increases the water lost by sweating but the urinary output may be reduced. The long-term effects of life in a warm climate on sweat output require further study. Thirst is not an adequate guide to water requirements, and if drinking water is not palatable, a man is not feeling well or is mildly seasick, he may not drink enough. Or it may just be his habit to drink too little to meet his real requirements in a warm environment. The increased incidence of renal colic in ships in the tropics gives a clear pointer that men may become chronically dehydrated when their appetite does not prompt them to drink enough to

[1]A convenient test is that described by Fantus (1936) *J. Amer. med. Ass.* **107**, 14. Ten drops of urine are measured into a test tube. The pipette (or fountain pen filler) is rinsed with distilled water and one drop of potassium chromate solution (20 per cent.) is added as an indicator. The pipette is rinsed again, and then silver nitrate solution (2.9 per cent) is added one drop at a time, and the test tube is shaken after the addition of each drop. The end point is a sharp colour change from yellow to brown. It is important to make a preliminary test with distilled water to ensure that there is no contamination of the chromate with chloride. The number of drops needed to produce the end point gives the concentration of chloride in the urine expressed as grammes of sodium chloride per litre—e.g. 5 drops = 5 grammes of NaCl per litre. In concentrated urine less than 3 grammes per litre is suggestive of depletion. If the urine contains 5 grammes per litre or more the patient is unlikely to be suffering from salt depletion. (Harrell, H. L. (1950) American Lecture Series No. 32. Charles C. Thomas, Springfield, Illinois.)

[2]A suitable test paper known as "Urichlor" is manufactured by Johnsons of Hendon, Ltd. (London, Eng.)

prevent stone-formation in the kidneys One ship in the Pacific reported 8 cases in four and a half months last year from a ship's company of about 820 (an annual case rate of 27 per thousand) of whom 3 were invalided from the station[1]

Practical Issues

Although the problem is complex most of the practical remedies are obvious Many heat casualties occur in unacclimatized men doing hard work Their work load should be watched carefully and may have to be reduced if the weather suddenly becomes appreciably warmer or more humid when the wet-bulb temperature is over 70 F

Men who are nearing the limits of their endurance under excessively warm conditions are often in a state simulating that seen with anoxia They cannot be relied on to know when they have had enough and may continue to work on automatically if allowed to do so It is desirable that whoever is in charge should not be exposed to such severe stress as the men or he may fail to recognise imminent casualties or to act promptly and correctly when they occur

It is a platitude that tired men will succumb before those who are fresh But the practical implication of this that when men are not working in a warm atmosphere everything should be done to ensure that they may rest and sleep at night in a comfortably cool place so that they may return to their labours refreshed, attracts less attention than it deserves Furthermore, this will practically eliminate prickly heat as a problem Sleeping on the upper deck on safari camp beds is still one of the sovereign remedies for getting a few hours cool and restful sleep even in the least habitable ship when this is permitted by the operational situation

This paper is published by the kind permission of Surgeon Vice-Admiral Sir Cyril May *K B E C B M C* F R C S, Q H S, Medical Director-General of the Navy

REFERENCES

Admiralty Book of Reference 1094 Instructions for the Design and Installation of Ventilation Arrangements in H M Ships

Bedford T (1946) Medical Research Council's War Memo No 17 H M S O London

Cameron K (1949) *J ment Sci* **398**, 133

Cook E (1955) *Mil Surgeon* **116** 317

Ellis F P (1948) *Brit med J* i 587

—— (1952) *Lancet* **2**, 527

—— (1953) Fatigue Edited by W F Floyd and A T Welford (H K Lewis and Sons London)

—— (1955) *Mil Surgeon* **116** 323

—— (1958) *J roy nav med serv*

Haldane, J S (1905) *J Hyg Camb* **5**, 494

Horne, G O and Mole R H (1951) *Tr Roy Soc Trop Med and Hyg* **44**, 465

Houghten F C, Teague, W E and Miller W E (1926) *J Amer Soc Heat Vent Engrs* **32**, 437
——, and Yaglou C P (1923) *Trans Am Soc Heat and Vent Engrs* **29**, 163
—— —— (1924) *Trans Am Soc Heat and Vent Engrs* **30** 193
International Statistical Classification of Diseases Injuries and Causes of Death 1955 (1957) World Health Organization Geneva
Ladell W S S (1957) *Trans R Soc Trop Med Hyg* **51**, 189
—— Waterlow J C and Hudson M F (1944) *Lancet* **2**, 491 527
Leithead C S Guthrie J de la Place S and Maegraith B (1958) *Lancet* **2**, 109
Macpherson K K (1949) Tropical Fatigue Univ of Queensland Papers
Marriott H L (1950) American Lecture Series No 32 (Charles C Thomas Springfield Illinois)
Schickele E (1947) *Military Surgeon* **100**, 235
United States Army (1954) Special Regulation 40 200 5
U S Department of Defence T B Med 175 NAVMED P-5052-5 AFP 160-4-1 7th August 1957
United States Marine Corps (1954) Training Bulletin 2-54 AO3c-hvk dated 29th June
United States Navy (1954) BUMED Instruction 6200 7
Weiner J S and Horne G O (1958) *Brit med J* **1**, 1533
Yaglou C P and Miller W E (1925) *J Amer Soc Heat Vent Engrs* **31**, 89

THE ATMOSPHERIC ENVIRONMENT BETWEEN DECKS

BY

Surgeon Commander F P ELLIS R N

A Matter of Compromise

Success in the construction of a warship can only be achieved by endless compromise, compromise between the requirements for space and weight for weapon detection and communication systems propulsion and other machinery and armour and the space needed for the accommodation of the crew and the weight of refrigeration or ventilation systems to make it habitable, compromise between the need for providing healthy atmospheric conditions between-decks and providing an efficient damage control and atomic biological and chemical warfare defence system which will maintain an airtight "citadel", compromise between the need for sufficient hands to operate and maintain equipment of ever-growing multiplicity and complexity and the need to keep the complement to the minimum compatible with full fighting efficiency and to prevent overcrowding and the extravagant use of space for accommodation, compromise between the various financial priorities which, in the last resort determine what goes into a ship and what does not—for example an additional radar set or air conditioning for the mess decks! The Naval Staff states the requirements for a new ship The Controller's Departments try to fit all these into an efficient design and the story of a new ship is one of "give and take" and "calculated risks" from start to finish

It is a responsibility of the Medical Director-General of the Navy to advise on the various environmental limits within which the designers must keep to ensure that the atmosphere between decks will be conducive to a healthy way of life and optimum efficiency in all quarters of the globe where ships must operate, and, as the equipment and the operational plan is always changing these standards must be kept under constant review For example the upper level of carbon dioxide which was considered compatible with health and efficiency in a conventional submarine of the World War Two era, which rarely submerged for more than 17 or 18 hours in any one day is likely to be very different from what can be allowed in the true submersible of the future which may be required to remain submerged continuously for one two or three months at a time, and to carry out repeated cruises of similar duration

Such values as these have to be defined sometimes of necessity provisionally in terms of figures to which the designers can work before the latter can commit the ship to the drawing board—when it is still "a gleam in the parents' eyes"—but they are under constant review and can only pass the ultimate test by ships' companies when the ship is built and operating under all the various conditions it has been designed to withstand. Then the ship's medical officer is the principal arbiter who reviews the evidence and advises his commanding officer, and through the medium of his Quarterly Journal the Medical Director-General of the Navy whether in fact the environmental requirements of the ship's company are satisfied and points to the areas where he considers modifications are needed.

The Admiralty Ventilation Committees

The problem is essentially one of accommodation and of maintaining effective standards of air hygiene. Much careful thought has been devoted to both aspects and in particular by two Admiralty Ventilation Committees which reported in 1914 and 1937.

The 1914 Committee accepted the standard conventional for those days that systems should be designed to keep the level of carbon dioxide in the atmosphere below 0.07 per cent by ventilation which provided 50 cubic feet of fresh air per man per minute on the mess decks. The 1937 Committee considered that the designer's aim should be to carry away the heat generated within ships rather than the carbon dioxide but the information available was inadequate to indicate how this might be done to the best advantage. In effect a reduction in the fresh air requirements to 33 cubic feet per man per minute was accepted and it was left to those who had to contend with these problems during the Second World War to work out the details. Air conditioning was not considered to be essential.

In 1944 the transfer of a large part of the Fleet to the Tropics forced an urgent review of the situation. The Medical Research Council's Royal Naval Personnel Research Committee was invited by the Admiralty to appoint a subcommittee to advise on problems of the environment between decks and in particular to define thermal standards for ventilating warships in the Tropics. After fourteen years the first phase of this Committee's deliberations is nearing completion.

In the meantime developments in thermonuclear, biological, chemical and aerial warfare have re-emphasized the need for warships to be closed down effectively and quickly when necessary and have called for a knowledge of the acceptable minimum as well as the optimum requirements for fresh air.

In the submarine world the post-war introduction of the British version of the German and Dutch schnorkel, the hollow mast which permits the continuous ventilation and diesel propulsion of a submerged submarine, and more recently the outstandingly successful introduction of nuclear-powered submarines in the United States Navy, with an underwater endurance which

is limited only by the "human factor" are providing environmental hygienists with a new and intriguing "family" of problems to solve

Although there have not been any further Ventilation Committees since 1937, the ventilation requirements at least those of surface ships were brought up to date in the light of World War Two experience in B R 1094 (1946) 'Instructions for the Design and Installation of Ventilation Arrangements in His Majesty's Ships,' which is revised appropriately as the need arises

The Space in Which to Live

Surgeon Vice-Admiral Sir Sheldon Dudley (1946) has summarized the warship problem thus What is the ratio of the space allocated to the human element to the space allotted to the mechanical element of the total fighting ship (ship plus ship's company) which will make the most efficient engine of war?' The priorities are weighted so heavily in favour of material that in practice this amounts to "what is the minimum space which can be allotted to the ship's company without imposing serious limitations on their health or efficiency?"

At the time when the 1937 Committee was sitting an average space of only 120 cubic feet per man was available on the mess decks in the Fleet This was later found to be inadequate for swollen war complements, and towards the end of the 1939 1945 hostilities ships were being designed to provide each man with a space of approximately 160 cubic feet or 20 square feet of floor space if there was 8 feet between the decks Experience has shown that this was the minimum which would accommodate a man and his equipment so that he could live reasonably for long periods during global operations In the Tropics up to 70 per cent or more slept on the upper deck on camp beds whenever they were allowed to do so which might not be permissible in another major war Even today with the most careful planning the complexity and diversity of a modern warship's equipment, and the numbers of men required to operate and care for it, permits only 20 square feet of floor space to be allocated for junior ratings and 25 square feet for those more senior, calculated for the full war complement When this is compared with the wartime minimum for naval barracks of not less than 45 square feet per man, or 30 square feet if double-tiered bunks were used it is obvious that here is a situation on which to keep a watchful eye

In submarines the average cubic space per man varies from rather below to rather above 100 cubic feet in the compact living and sleeping quarters but as a submarine is usually a single compartment for ventilation purposes the available volume of "breathable air" varies from 300 to 500 cubic feet for each man in the different classes

Thus the space allowances per man between decks tend to depend on the amount of space which remains to be divided up between ships' companies when provision has been made for the installation of weapons, equipment, machinery, and stores rather than on basic hygienic principles which at present escape precise definition, and the tendency to encroach on even this meagre

space allowance provides a constant challenge to the naval hygienist and to the ship's medical officer

The Thermal Environment

The climate between decks is probably next in importance to the space available The American effective temperature scales (Houghten and Yaglou, 1923 1924, Yaglou and Miller, 1925) are used for describing the thermal environment in British warships nowadays (B R 1472) These scales enable an observer to relate the thermal comfort sensations of persons engaged in sedentary or light occupations, wearing light clothing or stripped to the waist, and exposed to varying combinations of air temperature, humidity and turbulence to the temperatures of still and saturated air in which they would experience the same sensations of thermal comfort A correction proposed by Dr T Bedford is used to allow for radiant heat when necessary by substituting the globe thermometer temperature for the dry-bulb temperature when the effective temperature is determined to give a "corrected effective temperature"

Several alternatives to effective temperature as an index of physiological effect are under trial in England and the United States A notable post-war concept, suggested to the Royal Naval Personnel Research Committee by McArdle and his co-workers in 1947 for assessing the stress imposed by strenuous work and unduly warm atmospheres was to use the predicted four-hour sweat rate (or sweat loss), which could be determined for different conditions of climate work, and clothing from an empirical nomogram constructed from the data of experiments which they carried out in a climate controlled laboratory in London in 1944 and 1945 This system probably provides the most useful basis for a "stress index" which has been thought of since effective temperature, which essentially is a "comfort index" and it offers certain advantages over the latter, particularly when the sweat output is profuse, one gain being that an adjustment is made for differences in work rate as well as for climate It is, however, more difficult to use By definition, it can be employed only in the temperature range in which people sweat The data available were perhaps rather scanty for the construction of such a comprehensive nomogram At present it has been tested insufficiently for it to be considered more than a research tool which should be kept in the hands of those who know how to use it, but references to this index are now encountered frequently in the literature and Smith (1955) has shown that it is probably rather more accurate than effective temperature under certain conditions It is desirable for all hygienists to know that it exists and for the climatic physiologist to know how to employ the nomogram if he should be confronted with it It has been suggested by the Royal Naval Personnel Research Committee that the levels of warmth above which an increasing number of naval personnel serving under operational conditions in warships in the Tropics will be incapacitated by excessive warmth are those corresponding to a P 4SR (predicted four-hour sweat rate) value of 3 (Ellis, 1953) Meanwhile

the current value of effective temperature has been enhanced by an ingenious method proposed by Gray and Smith (1952), for predicting effective temperatures in the Tropics from measurements made on the mess decks in temperate waters

Levels of Effective Temperature for Men Engaged in Moderate Activity (106* kcal/m²/hr) which Correspond to a P4SR (Predicted 4–Hour Sweat Rate) Value of 3

Mean air speed (ft/min)	Men wearing overalls† — Effective temperatures corresponding to a P4SR of 3 and dry-bulb temperatures (°F) of				Men wearing shorts† — Effective temperatures corresponding to a P4SR of 3 and dry-bulb temperatures (°F) of			
	90	100	110	120	90	100	110	120
20	87 7	88 8	87 2	—	89 1	90 5	90 5	—
100	88 2	89 9	88 5	—	—	91 5	92 2	—
300	—	89 2	84 8‡	—	—	91 0	91 2	—

*The observed energy cost of the same working routine was 111 kcal/m²/hr in London but only 100 kcal/m²/hr in Singapore a difference which has not been explained entirely satisfactorily yet The P4SR values given here were calculated for 100 kcal/m²/hr and would be slightly more for 111 kcal/m² hr

†The higher basic effective temperatures for men wearing shorts emphasises that the normal and basic scales are not interchangeable

‡This unlikely figure is probably due to an error in the construction of the P4SR nomogram over the range of the lower wet bulb temperatures

The use of the dry and wet-bulb whirling psychrometer, the globe thermometer, the katathermometer and the charts which accompany B R 1472 is described in detail in this B R of which all medical officers should have a copy These instruments are not however always readily available, particularly the globe thermometer and katathermometer and their efficient usage does require some practice and is time-consuming Much valuable information is to be gained by the use of the whirling psychrometer alone which should be available in all ships A report on the dry and wet-bulb temperatures recorded with this instrument in a compartment considered to be unduly warm together with the dry and wet-bulb temperatures recorded about the same time on the upper deck in the shade to windward away from any hot air exhaust outlets or funnel draughts, and statements in general terms as to whether the air movement in occupied positions in the compartment is "poor" "good" or "very good" or whether radiant heat from hot bulkheads, machinery or other sources is of "negligible" "moderate" or "severe" degree, will supply the Admiralty with much of the information needed to decide whether or not this is a situation requiring further investigation, provided in hot climates that ventilation fans are running at full speed and that otherwise the ventilation system is being maintained and operated as the designers intended

When particular detail on constructional features is considered necessary

a survey of a compartment or group of compartments should be carried out in conjunction with other technical departments and, if possible, with advice from the Fleet Constructor Officer, and a conjoint report from the ship should be rendered to the Admiralty on Form S 1120 (Revised July, 1955) by the Commanding Officer (B.R. 1980 Item 24H and Q.R. and A.I., Article 2982 Clause 2 refer). Copies of these reports should also be forwarded to the Medical Director-General of the Navy when it is considered that the conditions reported prejudice the health or efficiency of ships' companies, with a covering letter to amplify the medical aspects of the situation.

A considerable amount of work was done in Singapore at the Royal Naval Tropical Research Unit between 1948 and 1953 to show whether the effects of short-term exposures to high temperatures, such as men would experience during a four-hour watch, are the same for acclimatized young men living in hot climates as they are for young men who are trained to work at high temperatures but live in temperate climates. This issue is vital to the interpretation in the Tropics of much of the current teaching which is largely based on experimental work in temperate climates. The answer is that to all intents and purposes the effects are probably much the same, provided both groups are similar and are equally trained to do the same sort of work and wear the same clothing. This confirms the finding of wartime studies that trained naval hot-room subjects in London were able to compete more effectively with the heavy work of handling ammunition than less well trained gun crews in the Tropics. Repeated physical exercise is probably at least of equal significance to repeated exposure to a warm atmosphere in the acclimatization of those with strenuous duties. The experiments in Singapore showed that long-wavelength heat radiations such as may be experienced in machinery spaces are not usually a major factor limiting a man's ability to work, and physiological support was provided for the use of Bedford's correction to the effective temperature scale to allow for this factor. The detailed results have still to be published.

There is convincing evidence that ships' companies were affected adversely by wartime conditions in warm climates. The average effective temperature in different types of compartment in the Eastern Fleet in 1944 were found to vary between 83° and 90° F, but more severe warmth was encountered frequently. Work took longer to do and was not done so well as in more temperate waters. Laboratory studies in temperate and in tropical latitudes confirm that deterioration occurs in the performance of tasks of even short duration when the effective temperature is in the lower eighties. When the average upper-deck dry-bulb temperature at noon exceeds 80° F, which corresponds approximately to average mess-deck effective temperatures of the same order (80° F), minor sickness, particularly skin disease, is more common. Furthermore, most people, whether on shore or in ships, feel uncomfortably warm when the effective temperature is above 80° F for more than a short time, their skin is moist with sweat, sleep is disturbed, and hot-climate fatigue is encountered more frequently as service afloat is prolonged (Ellis, 1952*a* and *b*

1953) The coincidence of an increase in discomfort and in minor ill health and a decrease in efficiency at these levels of warmth is undeniable

A provisional wartime recommendation that whenever practicable in spaces where men live or work in ships in warm climates the effective temperature (or corrected effective temperature) should be kept below 80 F is supported by the research work of the last fourteen years but comfort studies indicate that 78° F should be the upper desirable limit rather than 80° F This is the figure given in B R 1094 and it is in agreement with American naval practice Fortunately much of the criticism which has been aimed at the effective temperature scales does not apply to the temperature zone with which we are concerned when prescribing conditions for mess-decks workshops or offices and this recommendation does provide the constructor with the information he needs to design ventilation systems

When the thermal stress is more severe as in certain machinery spaces or when hard work has to be done, it is probably wiser for the medical officer to be guided by the wet-bulb temperature alone If the dry bulb temperature is in the region of 100 110° F a wet bulb temperature in excess of 92 F is likely to prove intolerable within a few hours for some trained and acclimatized lightly clad men engaged in moderate activity even when radiant heat is not an important factor and the air is circulating briskly The threshold wet-bulb temperature for less well acclimatized untrained or unfit men or for those wearing heavier or less permeable clothing may be 4–10° F below this or it may even be lower if heavy work must be done A wet-bulb temperature in excess of 88 89 F, may cause incapacitation of fit lightly clad acclimatized men engaged in moderate activity when the dry-bulb temperature is 120–130° F, and qualifying factors such as those listed above will lower this threshold according to their degree

If warships which are not air conditioned are closed down in tropical waters to protect against the hazards of flash burns flooding, or ambient air contaminated with harmful chemical biological or radioactive particles or droplets a rise in the wet-bulb temperature of the atmosphere of 5 to 14° F or more will occur in a few hours, and varies with the number and the sweat production of the occupants and the size of the compartment When the wet-bulb temperature at the outset is already well into the eighties as it will be in many ships of old construction when in tropical waters an intolerable state of affairs is likely to force the evacuation of some spaces before very long

The value of air conditioning for British ships in the Persian Gulf was recognized long ago In submarines during the Second World War it provided an outstanding example of effective control of the thermal environment in confined spaces, and its widespread application in ships of new construction has been declared to be the accepted Naval policy

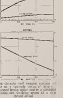
When air-conditioning is not available under very warm conditions, the adverse effect of "still" air, and the benefit derived from creating turbulent air currents with high-velocity ventilation terminals, ceiling or table fans or by natural means cannot be stated too strongly, provided the body is still

able to lose heat by convection, whilst the temperature of the surrounding air is less than that of the skin, or by evaporation whilst the vapour pressure of the air is less than that on the surface of the skin and clothing. In certain severe closed-down situations, however, when the above proviso cannot be met, increasing the turbulence of the air may be of little avail or may even add to the stress by increasing the convective heat gain. There should usually be facilities for men who work in very hot spaces to recuperate in a cool space where cool drinking-water and a palatable salt preparation are available.

At the other end of the temperature scale recent experience supports the opinion of the 1937 Ventilation Committee that in northerly or southerly waters air temperatures between 60 and 65° F are preferred by most men living and working between decks and wearing conventional clothing and are usually attainable. Thus attention now is focused more on the design of clothing and equipment which will keep a man warm and dry on the upper deck without impairing his working efficiency. There is, however, a need for more comprehensive data on the thermal environment between decks in ships operating at the lower climatic extremes.

Oxygen and Carbon Dioxide in the Air

When crowded compartments are closed down for prolonged periods the atmospheric oxygen is used up and the carbon dioxide level rises. These



Carbon dioxide and oxygen content of the air in a sparsely occupied air-conditioned living space and in a crowded air-conditioned working space of a ship closed down

changes also vary with the size of the compartment and the number and the activities of its occupants. The changes shown in this graph were recorded

in a cruiser under closed-down conditions in a typical living-space which was practically empty and a crowded air-conditioned working compartment. If the conditions in this working compartment had to be maintained for more than a few hours the fresh air supply would need to be re-established at intervals or equipment would have to be installed for releasing oxygen and removing carbon dioxide, unless the alternative of restoring the air supply and filtering it of potentially harmful agents was acceptable. In submarines carbon dioxide levels will be in the region of 3 per cent. of one atmosphere, the upper permissible limit for a 'conventional' as opposed to a nuclear-powered submarine, and mild anoxia (18 per cent. of one atmosphere) is unavoidable at the end of a long day's dive if no corrective measures are applied. For more prolonged submergence the upper permissible limit for carbon dioxide is 1 per cent. or less depending on the circumstances. An accurate knowledge of the composition of the atmosphere and of the acceptable limits will become of increasing importance as the underwater endurance of these craft is increased and is essential to an understanding of life in enclosed spaces.

Provided the volume of a completely airtight space is known and the number of occupants and their level of activity is stated, it is relatively simple from a knowledge of the textbook values for the oxygen consumption and carbon dioxide output for the average man to estimate approximately the oxygen depletion and carbon dioxide accumulation for varying periods in the closed down state. A man doing light work utilizes about 1.1 cubic feet of oxygen and exhales about 1 cubic foot of carbon dioxide per hour. With hard work these figures may be as much as 4.0 and 3.6 respectively. Where a situation is suspected in which it is considered that harmful anoxia or intoxication with carbon dioxide may occur, and a remedy is not readily available, the facts should be reported to the Admiralty so that analysts with the necessary equipment may be sent to the ship to make the necessary instrumental measurements and survey the compartment thoroughly.

Barometric Pressure

Changes in barometric pressure were not usually an important feature of the shipboard environment until the advent of the schnorkel and in surface ships they can usually be disregarded.

The air-supply inlet at the upper end of the submarine's schnorkel mast is fitted with a float valve which closes off the air duct, either intermittently or for a sustained period, when the air inlet dips beneath the surface, as it may in a choppy sea, or if the men controlling the hydroplanes make a mistake in depth-keeping. With intermittent opening and closing of the valve, the suction of the engines and the resistance of the narrow air duct cause a negative pressure within the craft which increases with the speed under water and the related demands of the engines. Novel features include (1) reduced barometric pressure, (2) concurrent mild anoxia equivalent to flying at between 4,000 and 5,000 feet, (3) pressures fluctuating every few minutes between values

equivalent to those encountered at altitudes of 4,000 to 8,000 feet, (4) more violent pressure fluctuations when the depth control is faulty and more sustained closure of the valve occurs, which give rise to otitic, sinus or dental barotrauma, and (5) traces of carbon monoxide when the schnorkel exhaust gases are drawn in with the fresh air supplies with a following wind or from unexpected submergence under diesel propulsion (Ellis 1949) These phenomena have been reduced to a minimum by modifications in the equipment and operating procedures by training and selection of crews and by eliminating the unfit, but under certain operating and sea conditions they must still be taken into account in this type of submarine

The Bacterial Content of the Air

Repeated wartime epidemics of respiratory tract infections in ships promoted an investigation of the bacterial content of the air in a newly built cruiser and a submarine in 1945 (Ellis and Raymond, 1948) Previous investigations on shore bad suggested that counts of bacteria carrying particles exceeding 50 per cubic feet of air were undesirable In most of the working compartments of the cruiser this level was not usually exceeded but it was on the mess-decks particularly when there was much activity in the bathrooms in the morning, and in the sick bay when cots were made up The relative importance of the numbers of infected airborne particles in cross-infection is still debatable When overcrowding is unavoidable an attempt should be made according to the circumstances, to control infectious material at its source by such measures as isolation of those infected, mass radiography, mass immunization, as effective and otherwise acceptable vaccines become available or by mass chemoprophylaxis during epidemics caused by known pathogens such as streptococci, but in these crowded circumstances, most epidemics of upper respiratory tract infections will run their course and natural immunity and a healthy ship's company are still probably the most effective defences available The air in the submarine was remarkably free of bacteria whether it was submerged or on the surface This may have been because about 365 cubic feet of "breathable" air was available for each man because bacteria-carrying particles adhered to the ducts of the ventilation system or to oily machinery as the air was recirculated through the engine room and other machinery compartments or in all probability because of both these factors

Preliminary tests in an air-conditioned space in the cruiser and in a climate-controlled laboratory in London indicate that a build-up of bacteria-carrying particles in the air does not occur even when the air is completely recirculated for a few hours A more recent study shows that this is still the case after a ship's compartment has been closed down for thirty hours but this aspect, and particularly the effect of prolonged recirculation in air-conditioned compartments with very low levels of fresh air replenishment, merits further investigation The evidence to date, however, is reassuring rather than otherwise

Fresh Air Supplies

The minimal supplies of fresh air which will permit [illegible] live a comfortable healthy and efficient existence in an enclosed space are thus influenced by a variety of factors Unrestricted heavy tobacco smoking causes malaise headaches, and upper respiratory tract irritation With air cooling 5 cubic feet of air per man per minute suffices to keep body and tobacco odours at acceptable levels With activated carbon filters in the ducts and air-cooling even 1 cubic foot per man per minute is found to be adequate, and carbon dioxide carbon monoxide, bacteria and dust should not reach objectionable levels In the Royal Navy at least 10 cubic feet per man per minute is supplied in air-cooled compartments when the cooling is in operation For compartments with normal ventilation an allowance of 10 cubic feet per man per minute is added to the amount which is calculated to be necessary to get rid of the heat within the compartment The total quantity must be equivalent to at least 30 cubic feet per man per minute (B R 1094) In the United States Navy a fresh air supply of 5 cubic feet per man per minute is the minimum required by design for air cooled compartments although for other reasons, this amount is usually exceeded in practice

Little is known about the effects of prolonged or repeated residence in a totally enclosed space There is no obvious reason why serious adverse effects other perhaps than those of a psychological nature should occur if the equipment for controlling the temperature and composition of the air is efficient and is used correctly The possibility should not be forgotten that in an unventilated or poorly ventilated space small amounts of contaminants, such as the breakdown products of fuels lubricants paints, cooking fats refrigerants or similar chemical substances which are innocuous in a ventilated compartment may affect men adversely if exposure is prolonged or repeated and one should always be on the lookout for such effects, particularly under novel or unusual operating conditions

Positive Health

The environmental health of a community contributes to its "positive health" Serious defects in the environment may not be reflected by obvious "negative health" It is thus advisable to supplement the bald records of sickness in the Navy by measuring the environmental factors and relating these measurements to established criteria of what is or is not desirable The requirements of the men must be appreciated against a complex background of material needs and tactical situations New instruments and techniques are now available to close many of the gaps which hampered this work in the past, and a fund of relevant information has been assembled at the Royal Naval Medical School and the Royal Naval Physiological Laboratory and at the office of the Royal Naval Personnel Research Committee and is available for reference to those who require it

This paper is published by the kind permission of Surgeon Vice-Admiral

Sir Cyril May, K B E , C B , M C , F R C S , Q H S , Royal Navy, Medical Director-General of the Navy

REFERENCES

Admiralty Book of Reference 1094 (1946) Instructions for the design and installation of ventilation arrangements in H M Ships

Admiralty Ventilation Committee (1914) Report

Admiralty (1937) Report

BEDFORD T (1946) *War Mem med Res Council (Lond)* No 17 (B R 1472)

DUDLEY S F (1946) *War Mem med Res Com (Lond)* No 17 preface

ELLIS F P (1949) *Brit J industr Med*, 6, 1 24

—— (1952a) *Lancet* 2 527

(1952b) *J Hyg (Lond)* 50, 515

(1953) *J Hyg (Lond)* 51, 386

—— (1953) *Ann roy Coll Surg Engl.*, 13, 369

—— and RAYMOND W F (1948) *Spec Rep Ser Med Res Coun (Lond)*, No 262

GRAY J A B., and SMITH, F E (1952) *Trans Instn nav Archit Lond* Meeting on 4th April Paper No 7

HOUGHTEN F C and YAGLOU C. P (1923) *Trans Amer Soc Heat Vent Engrs.*, 29, 163

—— —— (1924) *Trans Amer Soc Heat Vent Engrs* 30, 195

McARDLE B and DUNHAM, W., HOLLING H E LADELL W S S SCOTT J W THOMSON M L. and WEINER J S (1947) Quoted by SMITH F E (1955) *Mem Med res Com (Lond)* No 29

SIMS, A J (1945) *Trans Instn nav Archit (Lond)* 87, 50

SMITH F E (1955) *Mem Med res Com (Lond)* No 29

YAGLOU C P and MILLER W E (1925) *J Amer Soc Heat Vent Engrs* 31 89

MANUS ISLAND

BY

Surgeon Lieutenant B McMAHON WADHAM, R.A.N.R

In 1956 I had the opportunity of serving for several months in H.M.A.S. *Tarangau*, the Royal Australian Naval shore establishment at Manus Island. Some account of life at this tropical outpost may be of interest to readers of this Journal.

Topography

Manus, with the adjacent island of Los Negros, makes up the main bulk of the Admiralty Islands. These two islands are separated by a shallow strait, barely 100 yards wide in places. To the North, enclosed by a chain of reefs and coral islands, is Seeadler Harbour—one of the finest in the world. It is from the native word for sea eagle (=German seeadler) that *Tarangau* takes

its name The naval establishment lies on Lombrum point a promontory of Los Negros reaching out into the south eastern corner of Seeadler Harbour

The Manus group lies about 100 miles south of the equator and some 250 miles north of Lae, which is the most important centre on the north coast of New Guinea Manus and Los Negros form a land mass about 80 miles long, with jungle-covered hills and, down in the south-west mountains rising to nearly 2 500 feet

Administration

The Admiralty group forms part of the United Nations trust territory administered by Australia, together with her own territory of Papua through the Territory of Papua—New Guinea Administration, colloquially known in the region as the ' Admin '

The Administration's regional headquarters is at Lorengau about 7 miles from Lombrum on Manus proper The district is in the charge of a District Commissioner and government services provided include Education Health Customs, Agriculture and Police

Climate

For a tropical climate the weather conditions at Lombrum are excellent There are two seasons, the wet ' or North West from late November until March and the "dry" or South-East season Most of the island's 130 or so inches of rain fall during the wet season but there are occasional afternoon showers throughout the dry season and there are usually useful falls in July

The temperature ranges between 75 and 95° The evenings are nearly always pleasantly cool and as Lombrum Point juts out into the harbour, there is usually enough air movement to keep one reasonably comfortable

The People

The indigenous people of Manus are Melanesian Most of the labourers employed in these islands are recruited from the New Guinea mainland (These days this means meeting the cost of air transport from New Guinea to Manus and back again to their homes on expiration of their two year contract) Manus islanders seem content to remain as they are they are well fed and thanks to the constant efforts of Patrol Officers and Missionaries, reasonably well housed—by native standards

Service Living Conditions

Living conditions in *Tarangau* are good Some of the old living blocks are gradually being replaced by new airy quarters For married personnel (serving a two year term) there are a limited number of residences most of them rebuilt and much-modified "Quonset huts which if properly sited make very pleasant dwellings Each is fully equipped with electric stove and refrigerator and has its own hot water service For those who can be bothered, gardening can add much to the surrounding beauty

Sporting facilities include two ovals floodlit tennis courts and swimming pool and a cinema which can be cleared for indoor sports Near by, there is

a rather small strip of beach which is excellent for swimming during most of the year. On the ocean side of the island there are coral reefs teeming with tropical fish to fascinate the underwater explorer.

Medical Responsibilities and Facilities

The Royal Australian Navy provides two medical officers to look after the medical needs of the personnel of *Tarangau*, also the Royal Australian Air Force station at Momote (about 8 miles away) and the Company of Pacific Islands Regiment troops stationed at Nutt Point (about 3 miles from Lombrum). Nominally the Administration Medical Officer cares for the wives and children of Service members but since the two bridges on the road from Lorengau to Lombrum fell into such disrepair after the war that they became impassable for anything heavier than a motor cycle, much of this work falls to the naval medical officers. (One of the road bridges has been rebuilt and work begun on the other since the time of my appointment.) Virtually, then, we were responsible for a general practice covering some 600 Europeans, about 180 native servicemen and police and about 500 native labourers. In addition we were frequently called upon for emergency treatment of the few civilians and 600 or so natives of the surrounding district.

At Lombrum there is a well-equipped Naval Hospital for Europeans. At present this has only 16 beds but, without erecting new buildings or much construction work, it could accommodate double that number comfortably. The operating unit is air conditioned and the autoclaving and sterilizing equipment all electric. There is a reasonable radiological set-up and the laboratory facilities are good. There is a good dental surgery under the same roof. The Naval Dental Officer was kept fully occupied at all times.

As well as this new hospital, there is a 20-bed Native Hospital run by the Navy. This has its own operating theatre which could be used in an emergency. It is staffed by Native Medical Orderlies under the supervision of a member of the Sick Berth Staff and visited daily by one of the naval medical officers.

Civil Medical Facilities

The Administration Medical Officer was responsible for the medical care of the inhabitants of Manus and all the surrounding isles of the group, some of which are 250 miles to the west. The total population is around 10 000. He is assisted by two European Medical Assistants and a crowd of native orderlies, some of whom are very able. There is a small European hospital at Lorengau and a native hospital capable of holding some 200 patients, including their relatives in many instances. In addition there are outlying medical aid posts, each in the care of a medical orderly.

The relations between Administration and Naval medical officers have been most cordial and, needless to say, we frequently met for consultation and to assist with operative procedures. I was fortunate enough to be asked to join a party sent by the Administration to a little frequented part of the south coast in order to investigate an outbreak of probable whooping-cough. It

was this trip which enabled me to see some true native villages (The villages near Lombrum are mainly shanty towns built with wartime scrap salvaged from the jungle) I also experienced for an all-too-brief two days the conditions under which government officials live when "on patrol " Some of the scenery on that trip was superb

Clinical Material

As to the types of conditions met with—one must be prepared for everything in the book! I had been at Lombrum only a few weeks when an Administration boat arrived one night from Lorengau with an urgent request for me to give the anaesthetic for a desperate Cæsarean section on a native woman with a known anæmia (hæmoglobin 60 per cent) complicated by an ante-partum hæmorrhage, due to placenta prævia and probable pulmonary tuberculosis She was successfully delivered of a fine live baby and was completely unperturbed by the ordeal, whilst the surgeon and I eventually recovered

One Sunday afternoon, a truck laden with natives overturned The result—1 dead and 20 in hospital Incidents like this stick in one's memory but the great bulk of our work was of course, with simple everyday things

In the European Hospital, we had 170 admissions in the nine months of my stay The commonest reason for admission was minor trauma (43 cases) By admitting patients with even quite small lacerations particularly of the lower limbs we were able to keep down the number of tropical ulcers developed Tropical ulcer is a real "nuisance" condition quite minor breaches of the skin may lead to ulcer formation We made it a firm rule to keep covered any skin breach below the knee 10 of the admissions during this period were for tropical ulcer Upper respiratory tract infections accounted for 27 admissions and 21 patients had skin conditions (mainly infected insect bites) Surprisingly troublesome skin lesions were rarely encountered presumably due to the fairly high general standard of personal cleanliness and the minimum of clothing worn Our most exasperating condition was otitis externa for which there were 13 admissions—all patients who had failed to respond to lengthy and thorough outpatient treatment These were mainly people who had suffered ear infections in cooler climates and my personal feeling is that any serviceman with a history of discharging ears should be excluded from tropical service if at all possible

There were only 2 proven cases of malaria amongst European servicemen during this period, this speaks well for the malaria prophylaxis (both these patients admitted laxity in this regard), as the area is highly malarial

Of the 234 Native Hospital admissions over the same period, minor trauma and upper respiratory tract infections accounted for roughly a quarter each We had 14 patients with pneumonia—a high incidence amongst a population of about 700 adult males We met with several instances of pulmonary atelectasis following a common cold These patients had minimal chest signs (or none at all) and were diagnostically perplexing until we learned to X-ray the chests of all patients with a history of malaise, slight fever (never

over 100° F whilst in hospital) and a persistent slight cough following a cold All responded rapidly to physiotherapy (percussion and postural drainage and breathing exercises) under penicillin "cover"

Of the purely tropical diseases the commonest was tinea imbricata locally known as girili In most cases this responded to attack with salicylic acid and triple dye Yaws was occasionally seen but its manifestations are so protean and our experience so limited that we may have missed many cases Filariasis seemed to be fairly common, mainly in labourers brought from the New Guinea mainland With the Medical Assistant from Lorengau I did a midnight survey in a near-by village and we found microfilariæ in 5 per cent of the inhabitants in a single thick blood smear from each person in the village We did not meet with any cases of leprosy in the area but lepers are occasionally detected amongst Manus islanders

Malaria Prevention

The siting of H M A S *Tarangau* makes it possible to achieve complete eradication of the anopheline mosquitoes in the wet season In the dry south east season, a large degree of control should be possible but there will always be some mosquitoes blown in from a fairly large expanse of swamp about three-quarters of a mile from the establishment.

All personnel sleep in mosquito-proof quarters or else under nets Night clothing, consisting of trousers socks and long-sleeved shirts is worn at night to minimize the area of exposed skin

Chemoprophylaxis in the form of amodiaquin, three tablets (= 450 mg of base) once weekly is given to all naval personnel There is no doubt that this regime is adequate and efficient The drug must be continued for at least six weeks and preferably three months after leaving the area However amodiaquin does cause some discomfort to many people—particularly gastro intestinal disturbances The side effects can be minimized by taking the drug with food and in a divided dose Administration of 150 mg thrice weekly would probably be satisfactory but such a scheme would be difficult to supervise (At present the drug is taken at payment and at a special mustering on "non-pay" weeks)

The R A A F prophylaxis consists of chloroquin—150 mg of base, three times weekly This appears to be quite as effective as amodiaquin Personnel who cannot tolerate these drugs may substitute proguanil hydrochloride, 200 mg daily

The "P N G"

No account of H M A S *Tarangau* would be complete without some mention of the Papua New Guinea division of the Royal Australian Navy There are about 60 Native ratings many of them serving a second three year engagement, with native Leading Hands P O s and now, one Chief Petty Officer They are mostly, first-class seamen and they are intensely proud of the service Members of the "P N G" command great respect and prestige in their home villages and the Division will never face recruiting difficulties

Clinical Notes and Cases

THE RELATIONSHIP BETWEEN GINGIVITIS, DENTAL CARIES EXPERIENCE, STATURE, INTELLIGENCE AND PLACE OF RESIDENCE IN 15-YEAR-OLD BOY ENTRIES TO THE ROYAL NAVY—A PILOT STUDY

BY

Surgeon Lieutenant Commander (D) P. M. C. JAMES, R.N.V.R.

STAGNATION of residual foodstuffs about the teeth is undoubtedly a common factor in the production of both dental caries and gingivitis but a wide variation exists in individual susceptibility to the incidence and severity of the two diseases. The association between gingivitis and caries has been considered by several workers (Brucker 1943, Day 1944, King 1945, Massler and Savara 1951, Massler Ludwick and Schour 1952). The findings suggest that there is no direct or inverse relationship between the two, although it was noted by Massler and Savara (1951) that children with severe gingivitis tended to have a higher dental caries attack rate. Malnado (1947) also found that subjects with gingivitis had a higher incidence of dental caries.

A pilot study was carried out in H.M.S. *Ganges* in 1955 and 1956 on boys between 15 and 16 years new entries into the Royal Navy, primarily to determine the relationship between their gingivitis and caries experience. Information was available from Admiralty records on individual intelligence and aptitude scores, stature, weight and home address, so comparisons were made in an attempt to find relationships between any of these variables. Bruckner and Hill (1952) found a correlation between intelligence quotients and caries experience in 165 American children of 6–10 years, the higher I.Q. group showing a lesser dental caries experience. Cunningham (1934) and Hurme (1936) both found a tendency for higher dental caries incidence in taller subjects among groups from the United States of America. Hagan (1947) has demonstrated that caries experience can vary within narrow geographic limits, and Zwaardemaker and Tromp (1957) found that if dental caries incidence in the Netherlands was studied in relation to geographical distribution caries frequency increased from north to south.

The pilot studies in the present investigation were as follows:

(1) The relationship between dental caries and gingivitis.
(2) The relationship between dental caries and intelligence.

(3) The relationship between gingivitis and intelligence
(4) The relationship between heights and weights to dental caries experience
(5) A comparison between the dental caries experience of boys originating from north and south of a line joining the Severn to the Wash

Method

1,358 15-year-old boys entering H M S *Ganges* for initial Naval training were weighed (wearing vest and underpants), measured and examined for dental caries A sample of 304 boys was also assessed with regard to their gingival condition The group consisted almost exclusively of boys who had left their secondary modern schools without a General Certificate of Education

The Caries Examination

This was shared among five dental officers and was the routine detailed dental examination that is carried out on boy entries into the Royal Navy The findings were recorded on dental charts and expressed subsequently as the number of decayed, missing or filled teeth per boy Sticky fissures were regarded as carious, which minimizes the observational differences amongst examiners

The Gingival Examination

The author assessed the gingival condition of 304 random boys using the Parfitt modification of Schour and Massler's P M A index (Parfitt, 1957)

Severity and incidence were scored as described at length in a previous paper (Parfitt and James, 1958) Briefly, the mouth was divided into six segments, upper and lower labial segments, upper and lower left and right buccal segments, and the gingival condition in each segment was assessed according to an arbitrary scale of values ranging from no degree of inflammation (scoring 0) to severe inflammatory condition (scoring 5) The total value for the whole mouth had a possible range of 0–30

The Intelligence Examination

The T_2 examination is a four-part test of general intelligence of abstraction kind, practical mechanical comprehension, arithmetic and elementary mathematics, and mechanical aptitude measured by spacial and apperception tests

Table I—Dental Caries

No examined	*Total D.M F*	*Mean D M F*	*% Caries free*	*% with D M F 2 or less*	*% with D M F 12 or more*
1,358	8,428	6 2	3 92	14 13	10 6

Table II—Gingivitis

No examined	*Total P.M.A*	*Mean P M A*	*% with P M A 3 or less*	*% with P M A 13 or more*
304	2 280	7 5	17·4	13 5

V

TABLE III.—GINGIVITIS, DENTAL CARIES AND INTELLIGENCE
Of 304 boys 41 had severe gingivitis and 53 no gingivitis

Group	*No*	*Mean D.M.F. Index*	*Mean T_3 rating*
Severe gingivitis	41	7 5	77 2
No gingivitis	53	5 8*	81 9

*Denotes a significant difference.

TABLE IV.—DENTAL CARIES, INTELLIGENCE, WEIGHT, HEIGHT AND GINGIVITIS
Of 1 358 boys 144 had extensive dental caries and 192 had minimal dental caries
82 from these groups had also been examined for gingivitis

	No	*Mean T_3 rating*	*Mean weight* lb	*Mean height* in	*No*	*Mean gingival score*
Extensive dental caries	144	83 1	122 3	65 5	48	7 6
Minimal dental caries	192	82 2	122 78	65 5	34	7 0

TABLE V.—INTELLIGENCE AND DENTAL CARIES
Of 782 boys 105 had T_3 scores of 100+ and
121 scores of 65 –

Group	*No*	*Average D.M.F.*
Higher intelligence	105	7 28
Lower intelligence	121	6 8

TABLE VI.—INTELLIGENCE AND GINGIVITIS
Gingival score had been recorded for 43 of the
higher intelligence group and 53 of the lower
intelligence group

Group	*No*	*Mean gingival score*
Higher intelligence	43	7 34
Lower intelligence	53	7 18

TABLE VII.—COMPARISON BETWEEN BOYS RESIDING
NORTH AND SOUTH OF THE SEVERN WASH LINE

	Percentage caries free
North	2 71
South	5·05*

*Denotes a significant difference.

RESULTS

Tables I–VII show the results which may be summarized as follows

Dental Caries

96 08 per cent of the boys had decayed, missing or filled teeth. The total number of decayed, missing or filled teeth in the group was 8 438, giving a mean D.M.F. of 6 2 per boy. 192 boys (14 13 per cent.) had a D.M.F. of 2 or under, and 144 boys (10 6 per cent.) had a D.M.F. of 12 or over

These two groups, representing the ends of a wide range of caries experience were taken as samples of boys having respectively a low and high caries rate

Caries and Height

The average height of the boys in the selected groups was 5 ft. 5½ in There was no difference in the heights of boys in the high as compared with the low caries group If, however, the boys were grouped from the whole sample of 1 358 in heights instead of by caries rates there was an observed difference of 0 25 in the mean D M F of 166 boys of 5 ft 9 in and over compared with 169 boys of 5 ft 2 in and under, the taller boys showing the lesser D M F Statistical analysis of the findings showed that this mean difference is 1 92 times the standard error of the difference, just on the borders of significance

Caries and Weight

The mean weight of the high and low caries groups together was 122 6 lb The mean weight of the high caries boys was 123 3 lb, and that of the low caries group 122 78 lb The difference of the mean was not statistically significant

Caries and Intelligence

The mean T_2 of boys in the high caries group was 83 1 and that for the low caries group was 82 2 The difference is not significant

If the 782 boys examined between January and July 1955 are grouped according to their T_2 result 121 boys have scores of 65 or less and 105 scores of 100 or over The high T_2 boys have a mean D M F index of 0·48 more than the low T_2 boys and this difference represents 1 7 times the standard error of the difference

Gingivitis

The mean value for gingival condition in the 304 boys examined was 7 5 ± 4 1 points Of the 304 41 had a very poor gingival condition (scoring 13 points or above) and 53 had a very good gingival condition (scoring 3 points or below) The mean number of decayed, missing and filled teeth of boys in the poor gingival group was 7 5 and that in the good gingival group 5 8 This is a significant difference, representing 6 3 times the standard error of the difference

If the high and low caries groups were considered in relation to gingival condition the mean gingival score of the high caries group was 7 6 and that of the low caries group 7 0 an observed difference of 0 6 P M A in favour of the low caries boys This is not a significant figure

Gingivitis and Intelligence

The mean intelligence rating of boys in the good gingival group was 81 9, and in the bad gingival group 77 2 The difference of 4 7 points is not significant Grouping by intelligence rating rather than by gingival condition shows a difference in the mean P M A scores of higher intelligence boys and lower intelligence boys of 0 16, which is not significant

Dental Caries Experience North and South of the Severn Wash Line

Boys from north of this line showed a mean D M F difference of 0 14 more than boys from south of the line This is not significant 2 71 per cent of northern boys and 5 05 per cent of southern boys had no decayed, missing or filled teeth The difference of the two proportions is significant

Conclusions and Discussions

The findings demonstrate the very high incidence of dental caries in the United Kingdom 96 08 per cent. of all boys were affected Although the mean number of decayed, missing and filled teeth was almost identical for boys having their domicile north and south of the Severn-Wash line there was a significant difference in the percentage of caries immune boys on each side of the line, 2 34 per cent more of the southern boys being free of all evidence of caries

Gingivitis and Dental Caries Experience

Boys with severe gingivitis had an average of 1 7 more decayed teeth than those with no gingivitis This difference is statistically significant Boys with extensive caries had a mean gingival score of 0 6 P M A more than boys with minimal caries, a difference which demonstrates the general trend but is not significant This agrees with the previous findings that there is no direct or inverse relationship between dental caries and gingivitis, but that individuals with higher levels of gingivitis usually have more dental caries than those whose gingival condition is good

Intelligence, Gingivitis and Dental Caries

No significant relationships were discovered It might have been expected that higher intelligence groups would be lower in gingival score and dental caries experience as this is generally the clinical impression in general practice However, it must be remembered that the samples here studied were all of the same socio economic and educational background, and that intelligence *per se* without the necessary oral hygiene education and example may not be enough to induce proper mouth care It would be interesting to repeat this part of the investigation with boys of a higher educational standard.

Dental Caries, Heights and Weights

No difference was observed in weights, but the tallest boys had a mean D M F of 0 25 less than the shortest boys, which was on the borders of significance This is the reverse of the American findings

Acknowledgments

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REFERENCES

BRUCKER M (1943) *J dent Res*, **22**, 309
BRUCKNER R J, and HILL T J (1952) *J dent children* **19**, 64–68
CUNNINGHAM R L (1934) *J dent Res* **14**, 439–444
DAY C MARSHALL (1944) *Brit dent J* **76**, 115 and 143
HAGAN T L (1947) *U S Public Health Repts* **62** 1757
HURME V O (1936) *J dent Res* **15**, 395 396
KING J D (1945) *Dental Record* **65**, 32 and 55
MALINADO M (1947) Tesis de Prueba Universidad de Chile
MASSLER M and SAVARA, B S (1951) *J periodontol* **22** 87–96
—— LUDWICK W and SCHOUR, I (1952) *J dent Res* **31**, 195 198
PARFITT G J (1957) *J periodontol* **28**, 26
—— JAMES P M C and DAVIS H C (1958) *Brit dent J* **104**, 21 24
ZWAADEMAKER J B and TROMP S W (1957) *J dent Res* **36**, 795 799

CLINICAL TRIAL OF TRIFLUOPERAZINE IN MENTAL DISORDERS

BY

Surgeon Commander G. G. WALLIS, R.N.

CURRENT pharmacological opinion holds that phenothiazine tranquillizers act either by blocking excitatory or by stimulating inhibitory centres of pathways Chlorpromazine is thought to be a typical representative of the blocking group and prochlorperazine of the stimulating Trifluoperazine (T F P) is a new derivative of the latter class This drug differs from prochlorperazine in that a trifluoromethyl group has been substituted for a chlorine atom

In December 1957 and early 1958 at R.N Hospital Haslar, a pilot trial of this drug was carried out on 14 in patients, of whom 13 were male and one female Ages varied from 17 to 35 and the average age was 23 All were recently admitted and were selected simply on the grounds that a tranquillizer was indicated No attempt was made to use controls and the results were assessed purely on clinical impressions

The drug was given by mouth and with minor variations the dose was 5 mg a day for the first three days 10 mg a day for the second three days with subsequent increases of 5 mg every three days until an adequate therapeutic effect was produced or a reduction of dosage was indicated by side effects The maximum dose per patient varied from 10 to 45 mg daily (average of 28·2 mg) The duration of treatment varied from 2 to 81 days (average of 24 days)

The results are summarized in Table I Therapeutic effects were assessed by evaluating all aspects of symptomatology and the mental state 13 of the 14 patients derived some benefit, which, however was "marked" in only 3, all of whom had the diagnosis of anxiety state Psychopaths showed the least

TABLE I—THERAPEUTIC AND SIDE EFFECTS OF T F P

Diagnosis	No of cases	Therapeutic effects (1)	(2)	(3)	(4)	Side effects (1)	(2)	(3)	(4)
Early schizophrenia	4		3	1				2	2
Anxiety state	6	3	2	1		3	1	2	
Depression	1			1				1	
Post-concussional state	1		1					1	
Psychopathic personality	2			1	1	1			1
Totals	14	3	6	4	1	4	1	6	3

improvement Schizophrenics who might have been thought to fare particularly well on a major tranquillizer such as this, occupied an intermediate position

The assessment of side effects was difficult because it soon became apparent that the theoretically stimulating action of the drug may "spill over" from inhibitory to other centres, so that it becomes an activator Thus the commonest side effect was an uncomfortable restless, tremulous agitation with feelings and sometimes acts of aggression At first it was thought that this condition was an inadequately controlled manifestation of the primary disorder and therefore the dosage of the drug was increased However, experience showed that reduction of the dose or total omission of the drug often brought a dramatic sense of relief to both the patient and his doctor Of the 10 patients who had side effects this constellation of symptoms and signs occurred in 6, in one of whom it was combined with weakness and in another with confusion and dysarthria Other side effects were drowsiness in three patients (in one combined with impaired concentration) and malaise and feelings of instability in another

No Parkinsonism was seen and no hepatic hæmatological, cardiovascular or cutaneous changes were observed No dermatitis among the nursing staff handling the drug was encountered

It is interesting that of all three patients who improved ' Markedly" none had side effects but apart from this finding Table II shows that there was no correlation between the incidence of therapeutic and side effects

TABLE II—RELATION OF THERAPEUTIC TO SIDE EFFECTS OF T F P

Therapeutic effects	*Patients showing side effects* (1)	(2)	(3)	(4)	*Totals*
1	3				3
2		1	4	1	6
3	1		2	1	4
4				1	1
Totals	4	1	6	3	14

Key to Tables

Therapeutic effects	*Side effects*
1=Marked	1 None.
2=Moderate	2 Did not significantly affect therapy
3=Minimal	3—Complicated therapy
4=Unchanged or worse.	4—Nullified therapy

Other treatments, such as E C T (2 patients) modified insulin treatment (1 patient) and nocturnal sedation with barbiturates (9 patients) were continued as necessary during exhibition of the drug and no adverse results were encountered as a result of the combination

That this a powerful drug, having about ten times the dose-for-dose potency of chlorpromazine, is illustrated by the following histories

(1) A rigid conscientious man aged 35 with a high sense of duty and moral responsibility gave a history since an isolated act of masturbation four months before admission to hospital of depression insomnia aches and pains from the waist downwards and inability to think about anything except himself and ways of committing suicide. He was tense over-talkative ruminative restless and extremely hypochondriacal A month's psychotherapy and barbiturate sedation had no effect and he was convinced that he had done himself irreparable physical harm After six days on T F P he improved dramatically The drug was given for seventeen days with a maximum dose of 20 mg daily and there were no side effects He has since remained well

(2) An intelligent youth of 19 was kicked on the head two months before admission and had several hours antero grade amnesia Thereafter he complained of headaches dizzy spells fainting and irritability He was an only child whose family life had been disturbed by his mother's tuberculosis and by his being a disappointment to his father At the time of the head injury he was unhappy in the Service on distant terms with his parents in a precarious relationship with his fiancée and in a state of conflict about a German ancestry He showed signs of free anxiety After six days on T F P when at a dosage of 30 mg. daily he became very "fidgety" and fainted after which he was acutely confused and asked a senior officer why he had so much brass on his cap Later he stated "I thought he was an ordinary chap" He was dysarthric and had difficulty in visual accommodation The dose of T F P was halved and he became rational and reasonably composed but a week later when the dose had been raised to 25 mg daily, he slashed his left wrist in a tense and restless mood On a maintenance dose of 15 mg. daily he then improved steadily and after the drug had been used for a month he was discharged almost symptomless to duty

(3) A male aged 17 while undergoing cell punishment for bullying suddenly showed thought disorder perplexity a plate-glass rapport depersonalization ideas of reference and auditory hallucinations After only twenty four hours on T F P he became more rational and in better touch with his situation A week later when taking 15 mg daily he became drowsy and complained of difficulty in concentrating The drug was then discontinued and these symptoms disappeared but his mood was fatuous and he is now having a course of deep insulin

Conclusions

The impression gained for this preliminary trial on 14 patients suggests that S K F may be more valuable than other drugs in the treatment of certain anxiety states, but that its effect on young Naval schizophrenics is not generally so rapid or striking as that of chlorpromazine A high incidence of side effects implies the necessity for a low initial dosage, followed by a slow and cautious increase

Summary

(*a*) 14 patients suffering from a variety of acute mental disorders were treated with trifluoperazine

(*b*) 13 patients were improved to a greater or lesser degree

(*c*) Side effects occurred in 10 patients but there was no Parkinsonism and no hepatic, hæmatological cardiovascular or cutaneous changes were observed

The drug is manufactured under the name of "Stelazine" by Smith, Kline and French Laboratories, Ltd, who kindly supplied quantities of it for this trial

I am grateful to Surgeon Rear-Admiral G Phillips for permission to publish this note

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TWO CASES OF ALCOHOL-INDUCED BERI-BERI

BY

Surgeon Commander G. G. WALLIS, R.N.

EXCEPT for peripheral neuritis which is a frequent complication of chronic alcoholism and featured in both patients reported here, manifestations of avitaminosis B_1 (thiamin, aneurin) particularly psychological abnormalities, are rare in this country

De Wardener and Lennox (1947) in a remarkable study of 52 British prisoners of war whose diet in Japanese hands was deficient in thiamin, added the term cerebral beri-beri to the classically described neuritic, cardiac and œdematous types

(1) CEREBRAL BERI-BERI

A male aged 37 was admitted to hospital on account of acute confusion and difficulty in walking He complained of pain in the legs and feet cramp in the big toes tinglings in the legs and double vision He admitted that he had been drinking heavily for some years and that recently his diet had consisted entirely of alcohol, mainly gin He was reasonably calm denied hallucinations and had no delusions but was grossly disorientated for time He was extremely thin Findings in the nervous system included coarse tremor of the hands and feet ataxia impaired appreciation of touch and pain in the lower limbs, absence of vibration sense in the lower limbs and trunk tenderness in the calves, hyperalgesia of the soles dilatation of the right pupil and partial external ophthalmoplegia both external recti being completely paralysed Otherwise physical examination was negative and chest X ray blood count and liver function tests were within normal limits Blood W R and P P R. were also negative

Treatment by daily intramuscular vitamin B complex brought swift improvement Within three days eye movements were full and he was correctly orientated but for a few more days he was troubled by diplopia and could not read without an eye-shade.

There were no psychological sequelæ and in the following weeks he gained a great deal of weight Apart from hypersensitive soles there were no neuritic disturbances when he left hospital three months after admission

DISCUSSION

In 1881 Wernicke described 3 patients, 2 of whom suffered from delirium tremens and the other from persistent vomiting, who died after a period of ataxia, ophthalmoplegia and clouded consciousness Post mortem he found hæmorrhages in the brain stem, hypothalamus and mammillary bodies and,

believing the cause to be an inflammatory response to a chemical toxin, he called the condition acute superior hæmorrhagic polioencephalitis. Thereafter the close relation to alcohol was emphasized but in 1940 Alexander produced in thiamin deprived pigeons lesions identical to those occurring in alcoholics dying of Wernicke's syndrome and similar experiments have since been successful in other animals. Campbell and Biggart (1939) and Campbell and Ritchie Russell (1941) showed that Wernicke's encephalopathy could complicate many diseases other than chronic alcoholism. Wortis *et al.* (1942) demonstrated that the syndrome was associated with a raised blood pyruvate, which Peters (1939) had described as a usual finding, due to disturbed carbohydrate metabolism in patients with classical beri-beri. Jolliffe *et al.* (1939), Williams *et al.* (1939, 1940, 1945) and Elson *et al.* (1942) made controlled observations on induced thiamin deficiency in human volunteers and found that mental changes, such as inefficiency, impaired memory, confusion, depression and irritability developed early—long before gastro-intestinal, neuritic and cardiac dysfunction. Finally, de Wardener and Lennox (1947) showed that 79 per cent. of their patients with Wernicke's encephalopathy had signs of classical beri-beri and considered that the favourable response to thiamin was the best evidence of all that Wernicke's encephalopathy was in fact cerebral beri-beri.

This patient's cachexia gave rise to suspicions of carcinoma and tuberculosis but underlying pathology other than alcoholism and anorexia was finally excluded by his reaction to vitamin B and it may reasonably be assumed that the effective component of the complex was thiamin.

(2) Acute Cardiac Beri-beri

A male, also aged 37, was admitted to hospital with a six months' history of severe pains in the feet, numbness of the left hand, tremor, dizzy spells and impaired sleep and appetite, all of which were becoming more severe. There was a long history of alcoholism and in the previous few weeks he had evidently drunk more and more in attempts to relieve the pains in his feet and to procure sleep. His wife, who gave a lurid description of his spirit drinking and its effects on his family, could not remember when he had last eaten. She added that for three or four days before admission he had been having bouts of breathlessness. His past history included tachycardia, e.g. in 1947 his pulse-rate was 100 per minute.

When admitted he was mildly euphoric but gave a reasonable account of himself and was correctly orientated although his attention was mildly impaired. There were no delusions or hallucinations. The essential physical findings were:

General.—Well nourished. Good colour. Temperature normal.

C.N.S.—Coarse tremor of hands and lips. Broad based gait. Some generalized loss of motor power. Hyperæsthesia of soles. No obvious sensory loss. Tendon reflexes symmetrical and extremely brisk.

G.I.S.—Heavy brown fur on tongue. Soft and slightly tender liver edge palpable five fingerbreadths below costal margin. No spider nævi or palmar flush.

C.V.S.—Pulse regular at 100 per minute. B.P. 130/80. No other abnormality found.

R.S.—Respiratory rate 20 per minute. B.P. 130/80. No abnormality discovered.

Sedation and vitamin B complex intramuscularly were started and alcohol was completely withheld. He had a fair night but next morning was dyspnœic and disorientated. The radial pulses were impalpable except for an occasional flicker, blood pressure was in the region of 50/40 and heart rate 140 per minute, the sounds being very faint and the rhythm except for some bursts of gross irregularity regular. Normal saline was given by intravenous

[illegible] vitamin B [illegible] but these measures produced only very transient improvement and in spite of oxygen by nasal catheter he became increasingly cyanosed A warm skin and a rapid colour response to pressure on the nails suggested peripheral vaso dilatation Although restless and disorientated he remained at a relatively high level of consciousness. He died a little over twenty-four hours after admission

Discussion

Owing to the rapid march of events in this patient, no laboratory, electrocardiographic or radiological investigations were performed and the cardiac state could possibly have been due to hepatic failure, of which, however, there was no certain evidence The history of alcoholism and anorexia and the neuritic manifestations strongly suggested that heart failure was caused by lack of thiamin

Wood (1939) reported two examples of this condition, one associated with alcoholism and the other with self imposed semi-starvation owing to diarrhoea and colitis Despite the administration of thiamin both died, although the alcoholic responded temporarily O'Sullivan (1952) reported a similar patient who had "intractable chronic diarrhoea" and whose right heart failure responded dramatically to vitamin B[1] Hashimoto (1937) has recorded fulminating cases of this type in the U S A

Wood (1950) described cardiac beri-beri as a hyperkinetic circulatory state stressing peripheral vasodilatation and failure of the right ventricle as typical features

The pathology is reviewed by Partridge (1945) who found degenerative changes mainly in the auricular myocardium and the ventricular conducting system in thiamin-deprived pigs

It is seemingly anomalous that the circulation of the patient reported here should have failed after he had been put to bed and given parenteral vitamin B, it could be argued that sudden withdrawal of alcohol was a factor in precipitating acute circulatory failure but the non-alcoholic of Wood's (1939) patients collapsed and died on the day after admission to hospital

Following on Wenckebach's (1928) observation that an injection of pitressin removes the signs of peripheral vasodilatation and restores a peaceful circulation for about twenty-five minutes it would have been logical to give this patient pitressin The use of nor-adrenaline was carefully considered and was about to be put into practice when the patients died

Comment

According to Sinclair (1939) alcoholics become deficient in vitamin B[1] because they take a diet which is high in calorie value (most of the energy being supplied by alcohol) and, unless they drink beer low in vitamin B[1] content (since no spirit contains the vitamin) Presumably also inflammatory changes in the alimentary canal reduce absorption Williams and Spies (1938) showed that the requirements of the vitamin were proportional not to the total calorie intake but to the amounts of carbohydrate and protein in the diet,

beri-beri occurring when the thiamin/non-fat calorie ration fell below 0 3 mg per 1,000 cals These two patients were spirit drinkers so that both factors in the ratio were affected in the adverse direction

Although de Wardener and Lennox (1947) suggested that cerebral beri beri was due to an acute deprivation of thiamin and that other forms of beri-beri were commonly produced by a less sudden deficiency, no adequate explanation can be offered why one of these patients developed cerebral beri beri and the other cardiac

SUMMARY

Two cases of acute beri-beri one cerebral and the other cardiac, are described Both were heavy spirit drinkers The former responded dramatically to vitamin B and the latter died

My thanks are due to Surgeon Rear-Admiral G Phillips, for permission to publish this note

REFERENCES

ALEXANDER L (1940) *Auer J Path* 16 61
CAMPBELL, A C P and BIGGART J H (1939) *J Path Bact* 48, 245
—— and RUSSELL W R (1941) *Quart J Med* **10** 41
ELSON K O O SHEA, H E and HIGH R B (1942) *Amer J Med Sci* 203, 388
HASHIMOTO H (1937) *Aues Heart J* 13 580
JOLLIFFE N GOODHART R GENNIS J and CLINE J K (1939) *Auer J Med Sci* 198, 198
O SULLIVAN C J (1952) *J Irish Med Ass* 30 97
PANTRIDGE J F (1948) *Brit Heart J* 10, 252
PETERS, R A (1939) *Proc Roy Soc Med* 32, 807
SINCLAIR H M (1939) *Proc Roy Soc Med* 32, 812
DE WARDENER H E and LENNOX B (1947) *Lancet* 1, 11
WENCKEBACH H F (1928) *Lancet* 2 265
WERNICKE C (1881) *Lehrbuch der Gehirnkrankheiten, Berlin* 2, 229
WILLIAMS R D MASON H L, POWER M H and WILDER, R M (1943) *Arch Intern Med* 71 38
WILLIAMS R. D and SMITH B F (1939) *Proc Mayo Clin* 14 787
—— WILDER R M and SMITH B F (1940) *Arch Intern Med.,* 66, 785
WILLIAMS R R., and SPIES T D (1938) Vitamin B^1 (Thiamin) and Its Use in Medicine London and New York.
WOOD, F H (1939) *Proc Roy Soc Med* 32, 817
—— (1950) Diseases of the Heart and Circulation London p 514
WORTIS H BRUDING E, STEIN M H and JOLLIFFE, N (1942) *Arch Neurol Psychiat* 47, 215

SOME EXPERIENCES WITH INFECTION IN THE OPERATING THEATRE

BY

Surgeon Commander B. VICTOR JONES, R N

WOUND infection is still an important cause of morbidity after surgical operations It is regrettable that this should be so more than fifty years after such pioneers as Lister and Lane worked out the technique of aseptic surgery But it has to be admitted that despite their teaching and the advent of the antibiotic drugs the problem is still very much with us The subject is embarrassing, and articles about it were consequently rather scarce in the surgical literature until a few years ago However it is now fashionable to admit that sepsis still occurs in hospitals, and no apology is therefore made for recording two outbreaks occurring in naval establishments

FIRST OUTBREAK

The first outbreak occurred in a Royal Naval Hospital overseas A patient, who had shown no evidence of skin or respiratory tract infection, was subjected to meniscectomy For the first ten days after the operation he had no pain in the knee and his temperature never exceeded 98 4°F , but when the wound was inspected on the ninth day after the operation some redness of the suture line was noticed On the twelfth day after operation a severe infection of the knee-joint developed A culture of fluid aspirated from the knee grew a *Staph aureus* which was resistant to penicillin, moderately sensitive to aureomycin and terramycin and sensitive to streptomycin The infection ran a prolonged and severe course

This alarming occurrence of course called for an investigation to find out how the infection had occurred

All had not been entirely well with the aseptic technique during the six months I had been working in the hospital Two urinary infections had occurred after cystoscopes, they had been attributed to the fact that the theatre staff had been under the impression that a cystoscope could be adequately sterilized by keeping it in its wooden case with a tablet of formalin! Following an operation for excision of the head of the radius a minor superficial wound infection had occurred, from a small bead of serum which exuded from the wound were grown *B. proteus* and *B aerogenes* Type 2—a curious mixture of organisms to be found in what should have been a clean

surgical wound One or two other minor infections, amounting to no more than a little redness of the suture lines, had occurred On enquiry I found that my predecessor had been obliged to stop operating for a time during the hot weather because of wound infections.

All this amounted to no more than a cloud the size of a man's hand on the horizon—yet it was clear that something was wrong The instrument sterilization, autoclaving and aseptic ritual during operations were investigated and no breach of asepsis was found Cultures were grown from the air in the theatre and the dust on its floor—no pathogens were grown The noses and throats of the theatre staff were cultured and three of them were found to be nasal carriers of *Staph aureus*, but in each case the organism was sensitive to penicillin and showed other sensitivity differences from that grown from the infected knee joint

Despite redoubled aseptic vigilance by a theatre team who were by now very "touchy" about wound sepsis, a couple of months later wound infections occurred in two patients operated on for hallux valgus and ingrowing toenails respectively on the same day Both these wounds produced cultures of *B proteus* and *B aerogenes* Type 2 A common factor for these cases and the ones mentioned previously was sought and after discussing many possibilities it was remembered that Cetrimide solution (C T A B) had been used in the wound in all four cases A ready use bottle of this solution was kept in the theatre, it was freshly made up once a fortnight by diluting a 10 per cent stock solution to 1 per cent. with tap water, the bottle and cork being sterilized by boiling each time The Cetrimide in the ready-use bottle and its cork were cultured, and each produced a heavy growth of *B proteus* and *B aerogenes* Type 2

Here, then, was the source of some of our infections though it did not explain how a *Staph. aureus* came to be introduced into a knee joint

The Cetrimide was investigated It was found that the stocks we were using were probably about five years old and were thought to have been landed from the hospital ship *Maine* when she paid off The insides of some of the tins were found to be rusty, their contents were, however, sterile On further inquiry it was found that Cetrimide produced by the firm in question at the time these stocks were manufactured contained a certain critical percentage of inorganic material, which enabled such organisms as *B coli*, *Ps pyocyaneus* and *Aerobacter aerogenes* to grow in aqueous solutions of between 1 and 10 per cent, particularly if stored in corked bottles In our case the organisms probably came from the tap water which was used to make up and dilute the stock solution, for we were under impression that Cetrimide was self sterilizing

Apparently, similar trouble had been experienced at R N Hospital, Plymouth, some years ago, and as a result the manufacturers changed the composition of their Cetrimide in 1953 and state that this problem is now solved.

Following this experience all Cetrimide used in the hospital was freshly made up daily using small screw-topped bottles, which were autoclaved, and sterile water. No bottle was permitted to be used more than twenty-four hours after it had been opened.

No further case of wound infection occurred in the twelve months after this precaution was instituted. (It should be emphasized in passing that a statement like this has no statistical significance and must not mislead one into thinking that the problem of wound infection is solved. In fact, another isolated wound infection occurred two months after the end of this period.)

It remains to add that the origin of the *Staph. aureus* infection was never found—a common outcome to such investigations from what one reads in the literature. It may indeed have been that refuge of the destitute—a blood stream infection. A minor infection of the wound with Gram-negative organisms from the Cetrimide might have set up a "locus resistantiae minoris" which allowed the *Staph. aureus* to gain a foothold.

Second Outbreak

My next appointment was to an establishment in the United Kingdom with a Sick Quarters. On joining, I found that my predecessor had been troubled by an outbreak of staphylococcal wound infections. It could not be established with certainty how long this epidemic had been going on, but it appeared that cases of sepsis had been occurring with some frequency for at least two years. Of the last 11 "clean" cases treated by open operation, 6 had developed wound infections.

Investigations had indicated that the wounds were becoming infected in the theatre, and cultures from the dust of the theatre, anæsthetic room and changing room had repeatedly produced a heavy growth of *Staph. aureus*. The sterilization of gowns, towels, gloves and instruments had been scrutinized and the aseptic routine checked without any evidence of shortcomings being found. The accumulation of bottles and other rubbish and the tipping of ash outside the theatre windows had been considered a possible source of infection and had been stopped, without influencing the rate of sepsis.

The problem was therefore to find out why staphylococci had been getting into the theatre and why they had persisted despite the usual cleaning and antiseptic measures. An inspection of the theatre premises showed plenty of reasons for this state of affairs.

The lay-out of the theatre block at the time is shown in fig. 1. It had been the practice to do all minor septic operations, such as the incision of abscesses, in the changing room, and in addition all cases on the attending list requiring injections of penicillin were given them in this room. Almost all the septic cases dealt with by the sick quarters were thus treated there. Access to the theatre from this changing room was through the sterilizing room. The sterilizing room was so small—it only measures 7 ft. × 11 ft.—that it was

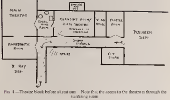


FIG 1 —Theatre block before alterations Note that the access to the theatre is through the sterilizing room

difficult to pass through it without brushing against the trolleys that were being laid up

This changing room/septic theatre therefore seemed a likely source from which organisms could be conveyed into the sterilizing room, and on into the theatre itself, by the clothing of the staff as they passed through and also by the dust in the air And dust there was in plenty too, for along the passage outside the theatre doors tramped all the ratings who had been given a PULHEEM examination in the converted ward at the end of the passage and were on their way to the X-ray department for their routine chest X-ray

Several other defects were found The theatre telephone was situated in the passage, so that a wave of dust was let into the suite every time anyone went out to answer it A few inches above floor level in the theatre and sterilizing room were numerous ventilators which even when closed allowed a draught to whistle across the floor and stir up the dust A number of pits in the theatre floor were acting as dust traps In the theatre ceiling was a large green-house-like skylight which formed a dust trap almost impossible to clean, as did the many pipes and conduits festooned about the walls of the theatre The open drain for the scrubbing up basins was in an unsatisfactory state of repair and decoration

The blame for this unsatisfactory layout does not lie entirely with the architect who designed the sick quarters more than half a century ago for the presence of permanently closed double doors to the sterilizing room showed that it had originally been used for a different purpose—probably as an

anæsthetic room When the unfortunate alterations were carried out is not known, but it is believed to be more than twenty years ago

It was clear that a re-organization of the suite was necessary, and operating was stopped until this had been done A first-class job was done by a co-operative and enthusiastic Works Department, and the new layout is shown in fig 2 It will be seen that the sterilizing room and anæsthetic room have

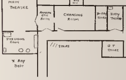


FIG 2—Theatre block after alteration Note that the sterilizing room and anæsthetic room have exchanged functions

exchanged functions The double doors into what is now the anæsthetic room have been opened up and those into what is now the sterilizing room permanently sealed off There is now no through traffic in the "new" sterilizing room, access to it being from the theatre itself only The plaster room at the far end of the passage has been made into a "dirty" theatre and the changing room is no longer used for operations The theatre floor and drain have been repaired The floor level ventilators have been bricked off and the "glasshouse" sealed off flush with the ceiling Many of the pipes have been boxed in or chased into the walls and some unnecessary glass shelves have been removed.

To prevent dust from getting into the theatre the PULHEEMS department has been moved to another place so that its examinees no longer use the passage, which has been closed off from the X-ray department All the doors leading from the passage into the theatre suite have been fitted with draught excluder seals

But air must be allowed to get into the theatre from somewhere Ideally it should come in from a positive pressure filtration and air-conditioning

plant But such things are expensive and we felt that unfiltered air from the exterior coming in well above ground level at low velocity would be acceptably safe One of the large high windows in the theatre and another in the sterilizing room have therefore been fitted with fine mesh fly screens At present no fans are fitted, but even if an exhaust fan should be found necessary to remove steam from the sterilizing room I do not think this would be a source of danger with the air intake as described

Other measures carried out include insistence that all personnel coming into the theatre wear theatre clothes and shoes and impermeable masks and some rearrangements in the surgical wards

The ward block consists of two 18-bed wards one on top of the other with a galley and two side wards each One of the downstairs side wards is the sister's cabin "Clean and "dirty" cases had formerly been admitted to both wards and all dressings had been done in the wards

The upstairs ward has been designated as "dirty and the downstairs as "clean" The upstairs galley and the remaining downstairs cabin have been made into dressing rooms and as far as possible all dressings are done in them and not in the wards Part of the downstairs ward near the door has been screened off as a "pre-op" and "recovery" room

In the five months since these measures were carried out some 60 open operations have been done on "clean" cases, no wound infections have as yet occurred.

Discussion

The technique of theatre aseptic practice has evolved over the years from the whims of surgeons the basic training of theatre sisters, the ideas of hospital architects and administrators and the comments, sometimes a little cynical, of bacteriologists How much is based on facts and how much on suppositions? Which of our precautions are really important and which are unnecessary fads? It is difficult to say But the experiences described above underline the importance of considering where the organisms which are getting into the wounds come from when dealing with an outbreak of infections

It is well known that the air about us is not sterile and that if we press our fingers on to an agar plate we shall be able to reproduce our "dabs" with colonies of *Staph albus* But I doubt whether the air—the uncontaminated, outdoor air—is often responsible for bringing organisms of sufficient pathogenicity into the hospital in sufficient numbers to be an important source of wound infection Nor do the commensals on our skins cause much trouble if our skin sterilization technique is sound

The answer is to be found in the "special" surgical units and hospitals which only deal with say orthopædic deformities or brain tumours In such units infections are rare—for the simple reason that they do not admit infected cases. It is the patient with tonsillitis or a boil in his axilla or an infected pilonidal sinus who brings the organisms into the hospital, it is the unfortunate

man whose burns are infected by them who ensures that they are reproduced in sufficient numbers to infect any wound that is dressed in the ward The writer remembers well a plastic surgery ward of 16 beds in a civilian hospital in which were 2 patients with burns and 14 patients who had had "clean" plastic operations Every patient had a haemolytic streptococcus infection of his burn or wound

It is the control of this state of affairs, and not the latest antibiotic or the minute refinements of the "no touch" technique, that is essential if sepsis is to be minimized In the Royal Naval hospitals we have gone a long way towards it by the provision of separate wards for "septics," and the use of special theatres and the full gown—and—glove technique for operating on them Indeed, I think we are ahead of many civilian hospitals in this respect But have we gone far enough? We would not dream of admitting a case of measles or scarlet fever into the surgical wards, should we not as Barber and Dutton (1958) have recently suggested, have isolation blocks for "septic" cases, each with its own theatre and a medical officer, sister and staff who are rarely excluded from the general wards and theatres? Is it fair to the man who is about to have a haemorrhoidectomy to put him—just because his is a "dirty" operation—in a bed next to the man with the ischio-rectal abscess, thus ensuring that the pain of what is already a most unpleasant procedure is enhanced by infection of his wound?

Unfortunately the ideal of segregation is not so easy to achieve in practice as it is to write about it But I think that, in the larger hospitals at least, a good case could be made out for admitting the potentially septic cases such as tonsillectomies and piles to special "intermediate" wards rather than lumping them in with the "clean" cases on the one hand or the already infected "septics" on the other After all, it is patients with wounds with large raw areas, inaccessible to dressings, such as these who are potentially the biggest "bug factories"

Occasionally organisms can be introduced into hospitals by other means than the suppurating lesions of patients Tetanus and gas gangrene may be introduced by the feet of one who inspects his farm before coming in to hospital, or by infected materials The only case of gas gangrene I have seen was in an elderly man whose leg was amputated for arterial insufficiency The operation was performed under refrigeration analgesia, as he lay dying from gas gangrene of the stump I remember looking out of the ward window and watching the ice being brought into the hospital—in a dirty, manure-stained, horse-drawn dray

Conclusion

These experiences are recorded in the hope that they may be of some help to others who are unfortunate enough to be confronted with outbreaks of wound sepsis One's natural reaction when faced with such outbreaks is to examine critically the details of one's own aseptic ritual and that of one's staff The experiences described above suggest that, while this is, of course,

important, a search for the source of the organisms is often more profitable than trying to find out just how they got into the wound

I wish to express my thanks to the many medical officers sisters and others who have helped to tackle these problems and to the staffs of the two theatres concerned and in particular Sister J Bulman for setting the high standard of theatre aseptic technique which has brought them under control

SUMMARY

Outbreaks of wound infection in a Royal Naval Hospital and a Royal Naval Sick Quarters are described In both cases the wounds were infected in the theatre, in one case an infected bottle of Cetrimide was responsible and in the other an unsatisfactory theatre suite layout.

Some views are expressed on keeping organisms out of the theatres and wards

REFERENCE

BARBER, M, and DUTTON, A A C (1958) *Lancet*, 2, 63

THE PATTERN OF THE INFLUENZA OUTBREAK IN THE PORTSMOUTH NAVAL COMMAND, 1957–8

BY

Surgeon Commander P K FRASER, R N, Dr L A HATCH and Dr K E A HUGHES[1]

In May, 1957 influenza A virus was isolated from an outbreak of mild but typical influenza in Hong Kong and Singapore Subsequently large outbreaks of influenza were reported from other parts of Asia, the Pacific area, North and South America, the Middle East and Europe

Influenza was expected to appear in this country during the summer and it was decided to investigate its effect on the personnel of the Command It is the practice here to admit patients with upper respiratory infections to a special unit and follow up studies are done where possible The essential mobility of the Service precludes this in all cases but a considerable number were so followed

CLINICAL METHODS

The admission routine of patients resembled that previously described (Fraser, 1958), except that gross overcrowding was unavoidable

[1]From the Department of Pathology, R N Hospital, Haslar and the Central Public Health Laboratory Portsmouth

From the middle of September an X-ray of the chest of all patients was taken immediately before discharge from hospital Initially those with positive radiological findings were allowed to return to duty and were followed by weekly X-rays later, all patients with radiological signs in the chest were retained in hospital until these had disappeared

All patients were treated with one tablet codeine co B P and 5 grains of soluble aspirin thrice daily Those with chest symptoms received menthol inhalations Antibiotics were given only for complications

Laboratory Methods

Paired sera, consisting of serum taken in the first ten days of illness and serum taken two weeks or more later, were obtained from many of the cases admitted. Throat swabs, by a method similar to that described by Hawkins and his group (1956), were also obtained from many of them Sera was stored at -20° C until they were tested in a complement fixation test by a method closely resembling that described by Andrewes and his colleagues (1956) against similar antigens of influenza A B and C adenovirus, psittacosis and *R burneti* In addition each serum was tested against the streptococcus M G suspension in an agglutination test Fourfold or greater rises in titre between the first and second serum samples were considered significant, other titres were disregarded

Throat swabs, which had been stored at -20° C or lower, were tested in Hela cell tissue culture, and examined in eggs for the presence of influenza virus by the method described by Hawkins and his group (1956) except that, owing to the type of equipment available considerable modifications of temperature and humidity occurred

A few pairs of sera considered positive by complement fixation tests, were tested by hæmagglutination (WHO Technical Report Series No 64 (1953)) against a Scandinavian a Dutch 56 strain and several Asian strains of influenza A virus

Findings

The patients with influenza showed a remarkably uniform clinical picture with pyrexia, flushed sweating skin tightness in the chest hoarseness a short non-productive cough, general myalgia and headache Coryza, rhinorrhœa and bowel disturbances were minimal Most cases showed slight redness of the throat without œdema or tonsillar swelling 18 had tonsilitis of whom 4 were subsequently confirmed serologically as influenza A Suppurative sinusitis and middle ear infection were rarely seen

The first patient with clinical influenza was admitted from a transport from Cyprus on 1st August Next day the first patient from this Command was admitted he had not been out of this country and had had no known contact with men recently returned from abroad From 3rd August to 17th August, 19 cases of mild acute upper respiratory infection were admitted

[illegible] of these were found to have either streptococcal pharyngitis or Vincent's angina and 11 were undiagnosed Subsequently 5 pairs of sera were tested from the last group and one was found positive for influenza A 53 further cases were admitted up to 31st August 16 had streptococcal or Vincent's infections, and of the remainder 16 were tested serologically and 12 had influenza A

In September, cases of influenza were widely scattered throughout the Command and it was decreed that where medical facilities were adequate centres would improvise accommodation for their own people This hospital continued to admit to capacity from the smaller centres During this month 246 patients were admitted Streptococcal and Vincent's infections accounted for 11 and 235 were considered to be influenza. From the latter 129 pairs of sera were examined, 112 were positive for influenza A, 1 for adenovirus and 16 were negative

258 patients were admitted in October and all were considered to have influenza. 179 pairs of sera from them were examined 157 were positive for influenza A and 22 were negative By the end of this month, the outbreak was considered to be abating

The pattern of infection remained unchanged during the first three weeks of November 52 patients were admitted 10 had streptococcal or Vincent's infections 34 had influenza and 8 had tonsillitis 13 of 21 patients with clinical influenza were confirmed serologically as influenza A One of the 8 cases of tonsillitis was considered serologically to have had influenza A and another, influenza C

The clinical picture changed abruptly during the last week in November when a further outbreak occurred in Centre C Here the recruit population was most affected Over 200 men were involved and they had been in the centre for a few weeks only and had no history of upper respiratory illness since they had been there Clinically the tonsils were grossly enlarged and inflamed, but not pustular this was accompanied by intense coryza and rhinorrhoea. 13 were admitted to hospital and 12 were shown serologically to have influenza A In addition 24 patients with similar symptoms were admitted from other centres 3 had streptococcal or Vincent's infections and 21 influenza 7 of 15 examined were confirmed serologically These cases appeared to be highly infectious to the staff most of whom had not been ill during the earlier part of the outbreak A few of the staff who fell ill had had influenza vaccine some weeks before but no laboratory investigations were made

Although Christmas leave began in December, 87 patients were admitted during that month 12 had streptococcal or Vincent's infections and 69 clinical influenza 48 of 67 examined were confirmed serologically as influenza A

In January 1958, 80 patients were admitted of whom, streptococcal and Vincent's infections accounted for 13, glandular fever 1, and clinical influenza

for 66. Of 61 pairs of sera tested, 22 were positive for influenza A, 1 for influenza C, 1 for *R. burneti*, 3 for adenovirus and 33 were negative. One patient showed significant rises in titre to influenza A and C.

From the end of September 270 chest X-rays were taken immediately before discharge. 21 showed a picture which became recognised as typically post-influenzal and presented as a "soft, diffuse homogeneous shadowing with ill-defined edges varying considerably in size and extent."

17 patients developed pneumonia in hospital and a further 29 patients were admitted with this diagnosis. One died and at autopsy confluent bronchopneumonia with mitral stenosis was found. No pathogenic bacteria or viruses were recovered from the lungs or upper respiratory tract.

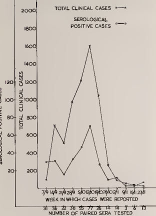
During the six months in which 754 cases of influenza were admitted, 615 pairs of serum were examined. Of these 386 (63 per cent.) showed significant rises in titre against influenza A, 4 against adenovirus, 9 against influenza C and 1 against influenza A and C when tested by complement-fixation. 53 pairs of sera which showed significant rises against soluble A antigen were tested in a hæmagglutination inhibition test. These were selected from each of the smaller centres where clinical influenza had been reported and were chiefly from those men who fell ill early in each outbreak. 47 of them showed fourfold or greater rises against one or more Asian strains of influenza A. During these tests it was noticed that there was comparatively little inhibition of the Asian strain A/Hong Kong/1/57 and A/Singapore/1/57 and that in many instances no changes in titres were found. When these sera were tested against A/England/528/57 significant rises in titre between acute and convalescent sera were apparent. This last strain was isolated from throat washings obtained from a schoolboy who fell ill near Salisbury in September, and has been shown to resemble the "Asian" strains of virus (M.S. Pereira, personal communication).

From 55 throat swabs which were examined in eggs, 13 strains of influenza A virus were isolated. Each was confirmed and shown to resemble the "Asian" group (M.S. Pereira, personal communication). Each of 73 throat swabs received was tested in Hela cell tissue culture but no virus was isolated.

6,614 clinical cases of influenza were reported from the Command between 7th September and 23rd November, representing an attack rate of roughly 1 in 4. The distribution of these, together with the weekly totals of those confirmed serologically as influenza A, are shown in the graph according to the week in which they reported sick. The pattern of infection in three of the larger establishments is shown in Table I, which indicates the weekly totals of those who reported sick with acute upper respiratory infections.

TABLE I.—NUMBER OF FRESH CASES REPORTED EACH WEEK FROM THREE ESTABLISHMENTS

Week ending	7/9	14/9	21/9	28/9	5/10	12/10	19/10	26/10	2/11	9/11	16/11	23/11
Centre A	88	186	119	191	75	29	38	13	7	7	1	14
Centre B	—	6	65	153	205	84	17	11	15	12	4	0
Centre C	—	11	53	73	47	50	31	6	4	4	1	0


TOTAL CLINICAL CASES
SEROLOGICAL POSITIVE CASES
SEROLOGICAL POSITIVE CASES
TOTAL CLINICAL CASES
2000
1800
1600
1400
1200
1000
800
600
400
200
120
100
80
60
40
20
7/9 14/9 21/9 28/9 5/10 12/10 19/10 26/10 2/11 9/11 16/11 23/11
WEEK IN WHICH CASES WERE REPORTED
31 36 22 38 55 77 26 14 14 3 6 13
NUMBER OF PAIRED SERA TESTED

Discussion

During the early part of the outbreaks few patients complained of sore throat, and conjunctivitis was seldom found The clinical picture changed at the end of November so that it resembled the findings of Holland (1957) namely that sore throat was present in about two thirds of the cases of influenza which occurred in certain R A F stations between 14th August and 2nd October

Between 7th September and 23rd November, 3 5 per cent of the cases admitted to the wards developed clinical pneumonia and 8 per cent had radiological signs of lung infections These findings are similar to those recorded in Singapore (Lim *et al* 1957) About 10 per cent of all clinical cases of influenza were considered sufficiently ill to require admission to hospital and at least 8 per cent had clinical or radiolog al signs in the chest during the same period

The serological tests on 223 patients who did not give significant rises in titre to influenza A indicated that identifiable virus infections other than influenza A were responsible for very little illness Many of this group had titres greater than 1/20 against influenza A and the failure to detect rises was due possibly to the times at which the sera were taken Although they have been excluded, they supplement the impression that the clinical diagnosis and laboratory findings were in close agreement

A smaller outbreak of influenza A had occurred in the first quarter of 1957 in this Command 21 cases were confirmed serologically and Dutch 56 strains of influenza A virus were isolated from 5 of 6 throat swabs The clinical picture consisted of pyrexia flushed sweating skin, rhinorrhœa, coryza and tonsillar swelling 2 patients had pneumonia 12 cases represented the total morbidity in a closed group of over 500 men The outbreak was sharply defined and the clinical cases were seen over a comparatively short period

During the 1957 autumn outbreak the greatest number of cases were seen over a period of about ten weeks from 7th September to about 2nd November About 60 fresh cases were seen in each of November December and January This shows that the outbreak lasted for at least six months, although most of the clinical cases occurred in September and October with an attack rate of about 1 in 4 in the two months It seems reasonable to suppose that most of the Command were susceptible to this strain of virus and that the typical pattern of an infectious disease in a susceptible population was followed By the end of the winter probably most of the personnel at risk will have been infected Since only five months had elapsed between the appearance of the new antigenic strain of influenza A in Asia and this outbreak with such a high incidence of cases, it is doubtful whether sufficient "new strain" vaccine to protect the majority of such a population could have been prepared during the time

The observation of the change in the clinical picture shown by the cases in Centre C at the end of November is interesting Laboratory investigations

did not indicate that any change in the virus had occurred, yet the appearance of gross inflammation of the tonsils with other signs of nasopharyngeal inflammation indicated that the infection had changed to resemble more closely the clinical picture found in the R.A.F. some two months earlier

SUMMARY

An outbreak of influenza A occurred in the Royal Navy, Portsmouth Command, during the period August 1957, to January, 1958 with the peak incidence of cases occurring between the second week in September and the third week in October. During this period some 6,000 cases were reported with an attack rate of about 1 in 4

Most cases showed typical symptoms of influenza with pyrexia headache, cough and general myalgia. In one centre during November a change in the clinical picture occurred and cases presented with gross inflammation of the tonsils, coryza and rhinorrhœa

615 pairs of sera from 714 cases admitted to hospital were examined in complement-fixation tests, 386 (63 per cent.) showed significant rises in titre against influenza A, 4 against adenovirus, 9 against influenza C and one against influenza A and C

13 strains of influenza A virus were isolated in eggs from 53 throat swabs, and have subsequently been confirmed and shown to resemble the "Asian" group

The incidence of pneumonia and other complications was no higher than other workers have reported and only one death occurred

ACKNOWLEDGMENT

We are indebted to the Medical Director-General of the Navy for permission to publish. We wish to thank Sick Berth Petty Officer J. A. Billings, Mr. J. Pilfold A.I.M.L.T., and Miss J. Forster, F.I.M.L.T., for their technical assistance and Miss F. Stranack, B.Sc., for preparing the graph

REFERENCES

ANDREWES, B. E., MCDONALD, J. C., THORBURN, W. B., and WILSON, J. S. (1956) *Brit. med. J.* i 1203

FRASER, F. K. (1958) *Can. med. Ass. J.* 78 186

HAWKINS, G. F. C., HATCH, L. A., MCDONALD, J. C. (1956) *Brit. med. J.*, ii 1200

HOLLAND, W. (1957) *Lancet* ii 840

LIM, K. A., SMITH, A., HALE, J. H., and GLASS, J. (1957) *Lancet*, ii, 791

World Health Organization (1953) Techn. Rep. Ser. No. 64 Geneva

ROYAL NAVY MEDICAL CLUB

A COCKTAIL party was held, on Friday 10th October, 1958 in the Hall of the Royal College of Surgeons Lincoln's Inn Fields

This was a most enjoyable function attended by some 250 members, their ladies and guests

The guests who were received by Surgeon Vice-Admiral Sir Cyril and Lady May included Sir James Paterson Ross, Vice-Admiral Sir Jeffrey Robson and Lady Robson Vice-Admiral D E Holland Martin, Sir John Lang, Miss Barbara Nockolds, Miss Kathleen Greenwood and Miss Katherine Richard

Members present included The Right Honourable The Lord Evans Dr Desmond Curran, Mr F Watkyn-Thomas Mr J Vaughan-Jackson, Mr H Jackson Burrows, Dr W D W Brooks, Sir Alun Rowlands, Surgeon Rear-Admiral H R B Hull, Surgeon Rear-Admiral F G Hunt, Surgeon Rear Admiral S G Rainsford Surgeon Rear-Admiral R L G Proctor Surgeon Rear-Admiral W R S Panckridge, Surgeon Rear-Admiral G Phillips Surgeon Rear-Admiral (D) C J Finnigan Mr H V Cross and Mr T Driscol

ANNUAL DINNER

The next annual dinner of the Naval Medical Club will take place on Friday, 24th April, 1959

Reviews

THE PRINCIPLES AND PRACTICE OF MEDICINE By Sir Stanley Davidson B A Cantab. M D, F R C P Ed, F R C P Lond, M D Oslo Fourth Edition Pp xi + 1067 with VII plates and 63 figures Edinburgh and London E & S Livingstone Limited Price 35s 0d Home postage 2s 0d

This very popular textbook already in its fourth edition in six years manages to keep pace with the rapid advances in medical knowledge but despite added material is smaller and more compact than its predecessor

The contents which are based on the wide clinical experience of the Senior Staff of the Department of Medicine at Edinburgh University are lucid, essentially practical and, for such a comprehensive textbook, most readable—an important asset

The sections on respiratory disease and on endocrinology possibly merit special mention The book is well written well printed and is light to the hand and to the pocket It can be fully recommended.

E D C

DISEASES OF THE NERVOUS SYSTEM By Sir Francis Walshe M D, D Sc F R S With chapters on The Neurological Complications of Liver Disease and Hepatolenticular Degeneration by J M Walshe M R C P Ninth Edition Pp xvii + 373 with 89 illustrations Edinburgh and London E & S Livingstone Limited Price 30s 0d

The first edition of this successful textbook by one of the world's outstanding neurologists appeared only eighteen years ago and yet since 1940 there have been a further eight editions published, in addition to reprints and translations into French, Spanish and Italian This

is surely an indication of the value and popularity of this relatively small book for such an extensive subject these days as clinical neurology. In it one seems to be able to find most of the information of clinical importance sought or needed in pursuing the progress of neurology. The author has kept the book up to date and yet limited the text to educational essentials. He has done this with an increase of only 16 pages in the new edition which costs six shillings more but is still very cheap in these days of expensive medical textbooks.

In the first part of the book (which as in former editions deals with The General Principles of Neurological Diagnosis) there are a few changes including the addition of a new summary on the so-called Brain Stem Activating Systems a result of modern opinion concerning the control of movements and tone and the functions of the brain stem hypothalamus and cerebral cortex in the maintenance of consciousness or the production of coma and sleep.

The main part of the book which incorporates a Descriptive Account of the More Common Diseases of the Nervous System contains two new chapters (contributed by the author's son Dr J M Walshe of Cambridge University) on the neurological complications of liver disease and hepatolenticular degeneration (Wilson's disease). The important chapter on Vascular Disorders of the Brain has been largely rewritten incorporating the latest information on cerebral arteriography with reference to intracranial aneurysms angiomata and thrombosis of the carotid and cerebral arteries. Out of three new illustrations in the book two refer to the above vascular section and the other to one of the new added chapters.

In this new edition the customary high standard of appearance and presentation is maintained but if in future editions it is necessary to omit a number of pages in order to include new subject matter without adding to the size of the book surely the final chapter on the Scheme of Examination of the Nervous System is hardly required in a textbook of this nature. Other minor criticisms permitted are the reference to the omission of various agents in the therapy of certain nervous diseases such as the importance of the corticosteroids in the treatment of post-exanthematous encephalitis and of the hypotensive drugs in the relevant encephalopathy and retinopathy. In the section on multiple neuritis there is also no mention in the aetiology of conditions such as Polyarteritis Nodosa (according to some authorities the third commonest cause today) and the anti-tuberculous drugs such as Isoniazid both of which could be mentioned at the expense of arsenic and other infrequent causes of neuritis.

This book will however continue to remain an essential for all clinical students both before and after graduation and one wonders whether the author will find it necessary to produce a further edition in yet another three years time.

L G T

THE PHYSICAL TREATMENT OF VARICOSE ULCERS. By R Rowden Foote F.I.C.S., M.R.C.S., L.R.C.P., D.R.C.O.G. Surgeon in Charge Varicose Vein Clinic, Harrow Hospital. Pp xii+125 with 58 illustrations. Edinburgh and London: E & S Livingstone Limited. Price 15s 0d net.

This is a book of practical instructions for physiotherapists and nurses concerned with the treatment of varicose and venous ulcers. In the first part the underlying causes of these ulcers are briefly clearly and simply discussed together with the factors influencing their progress. The part played by the physiotherapist is defined.

In Part II details of treatment by various types of compression, by special manoeuvres of massage and by physical exercises are given. There is also a chapter consisting of instructions to the patient in methods of preventing recurrence of the healed ulcer.

This is an excellent manual on the physical treatment of varicose ulcers, with all the detail required by the physiotherapist or nurse who deals with these common and disabling lesions. The illustrations are clear and the style precise.

Practitioners dealing with these cases will find much of value in this book.

J W

EYE SURGERY By H B Stallard, *M B E.*, M D F R C S Hon LL D Surgeon, The Moorfields Eye Hospital, Eye Surgeon St Bartholomew's Hospital Late Pathologist and Curator The Moorfields Eye Hospital Eye Surgeon, Radium Institute and Mount Vernon Hospital Officer of the Order of St John of Jerusalem, Major R A M C (T A) Third Edition Pp xn+899 with 671 illustrations Bristol John Wright and Sons Limited Price 95s 0d

The first edition of this work appeared in 1946 at the conclusion of the Second World War It fulfilled a lack in British ophthalmic literature which at that time contained no up-to-date book on ophthalmic surgery The second edition which appeared in 1952 showed considerable modifications and improvements with a reduction in the amount of space devoted to war surgery It soon became a favourite volume and the bedside companion of most young ophthalmic surgeons The third edition which has just been published is almost as thick as its two predecessors placed together but examination of the contents reveals this girth to be largely due to the incorporation of more than one hundred additional illustrations The text itself has not undergone great expansion but new information on anaesthesia, corneal grafting, acrylic lens implants and radioactive therapy is included The descriptions are clear and concise, and the addition of excellent new photographs and drawings has simplified the comprehension of the reader especially in regard to some of the more complicated procedures In the description of a surgical operation a short series of diagrams is often of greater value than a chapter of letterpress and the author has kept this fact in the forefront of his mind

The reader will feel that the descriptions and advice given are often counsels of perfection—as indeed they are He will also think that this perfectionism requires at times carefully selected and trained theatre teams with access to a wealth of specialized equipment, which is also true to some degree But the principles expounded, obtain whatever the circumstances, and the teaching urges towards a goal which while it may not be reached cannot but help the reader through his efforts to attain it The book is excellently produced and forms a personal message and inspiration to ophthalmic surgeons from an experienced teacher, who is internationally acknowledged as one of the great technical masters of our time.

D P G

THE DETERMINATION OF THE ABO AND RH (D) BLOOD GROUPS FOR TRANSFUSION Medical Research Council Memorandum No 36 (Revision of War Memorandum No 9) Pp vi+46 London H M Stationery Office Price 3s 6d

This is a revision of the 1943 Memorandum which has become obsolete by reason of the new methods introduced in the meantime The present Memorandum which is more than twice the length of the former one gives a concise account of all the precautions to be adopted in transfusion work whether straightforward or complicated by previous transfusions, pregnancies hæmolytic anæmia etc. There are adequate descriptions of the current methods of ABO and essential Rh group determinations direct matching of donors and recipients blood investigation of transfusion reactions and possible sources of errors in blood group determinations.

It is not possible to make the technique of blood transfusion absolutely foolproof but these instructions probably come as near to that ideal as is possible at the present time

It seems presumptuous to offer any criticism of a work by such a distinguished team as this one but the reviewer cannot help feeling a little unhappy about two points

In view of the occasional reports of fatalities due to the transfusion of infected blood one would have preferred to have a smear examination for infection included in the instructions before transfusion rather than kept for the investigation after a reaction has occurred

It is stated (p 36) that if several transfusions are to be given in a space of two or three days direct matching must be done with serum obtained before the first transfusion This

is on the grounds that antibodies present in the patient's serum might be absorbed if the first lot of cells were incompatible. Maybe so, but in that case two days is quite long enough for the patient to develop antibodies that were not there in the first place. Perhaps it would be safer after two days to do direct matching with fresh serum as well as the original sample.

This Memorandum is an absolute necessity for anyone who has the responsibility of issuing blood for transfusion and it should be kept within reach of the laboratory bench at all times. It is also highly desirable that every transfusion service should work to a routine based on the instructions given therein.

G. D. W.

We acknowledge with thanks receipt of the following publications:

Acta Medica Et Biologica. Anales De La Facultad De Medicina Montevideo. Annales Medicinae Internae Fenniae. Annals of Tropical Medicine and Parasitology. British Medical Journal. Bulletin of the World Health Organization. Chronicle of the World Health Organization. El Tarax. Fukushima Journal of Medical Science. Guy's Hospital Gazette. International Committee of Military Medicine and Pharmacy—15th Session of Conferences. Journal of the Royal Army Medical Corps. Journal of the Royal Naval Scientific Service. Kyushu Journal of Medical Science. Medical Journal of Osaka University. Middlesex Hospital Journal. Military Medicine. Montreal Medical. Nagoya Journal of Medical Science. Physiologia Bohemoslovenica. Proceedings of the Staff Meetings of the Mayo Clinic. Revue De Medecine Navale. Revue Internationale Des Services De Sante. Rivista Di Medicina Aeronautica. St Mary's Hospital Gazette. St Thomas's Hospital Gazette. The Australian Journal of Experimental Biology and Medical Science. The British Journal of Surgery. The Broad Way Westminster Hospital. The Gunma Journal of Medical Sciences. The Journal of the Bowman Gray School of Medicine. The Journal of the Irish Medical Association. The Kumamoto Medical Journal. The Kurume Medical Journal. The Medical Press. The Nuffield Provincial Hospital Trust—Fourth Report. The Tohoku Journal of Experimental Medicine. The Ulster Medical Journal. Tropical Diseases Bulletin. University of Durham Medical Gazette. Yokohama Medical Bulletin. Yonago Acta Medica.

BOOKS RECEIVED

SUCCESSFUL TECHNIQUE WITH SPECIALIZED OPAQUES. By Damancy and Co. Ltd., Manufacturing Chemists, Ware, Herts. Copies available on request. Pp. 28 with illustrations.

News of the Service

OBITUARY

Surgeon Rear-Admiral J J DENNIS died on the 4th August 1958 at his home at Beaconsfield He was 100 years of age

John Jeffreys Dennis was born on 22nd April 1858 the eldest son of Paymaster in Chief J R Dinnis R N He later changed his name to Dennis

Educated at Mannamead School Plymouth he then studied medicine at Queen's University Ireland and at Edinburgh In 1880 he graduated M D M Ch, and immediately entered the Royal Navy as a Surgeon He was promoted to Staff Surgeon in 1892 Fleet Surgeon in 1896 Deputy Inspector General in 1907 and Surgeon General in 1913 He was placed on the Retired List in the rank of Surgeon Rear Admiral in 1918

Admiral Dennis was Surgeon of H M S *Turquoise* during the operations in the Eastern Sudan 1884–5 for which he received the Egyptian Medal and the Khedive's Bronze Star At this time he qualified as an interpreter in Swahili

Between 1885 and 1887 he served with the Naval Brigade during the Burma War was present at the capture of Mandalay and took part in the expedition to Bhamo He received the India Medal, Burma 1885 7 Clasp

Between 1902 and 1903 he served in H M S *Highflyer* Flagship during the operations in Eastern Somaliland for which he received a medal and clasp

In 1916 as Medical Officer in-Charge of the Royal Naval Hospital Haslar Admiral Dennis was appointed C B in recognition of his services during the First World War, and in 1919 he became a Commander of the Order of the Crown of Belgium

Surgeon Captain J S AUSTIN R N (Rtd) died on the 19th June 1958 Born on the 13th October 1882 he qualified with the degrees of M R C S L R C P M B B S in 1906 and entered the Royal Navy as a Surgeon in 1908 Promoted Surgeon Lieutenant Commander in 1915 and Surgeon Commander in 1919 he was placed on the Retired List in the rank of Surgeon Captain in 1932

During World War I Surgeon Captain Austin served in H M Ships *Erin*, *Lucia* and *Gorgon*

Surgeon Captain J G BOAL R N (Rtd) died on the 28th August, 1958 Born on the 3rd May 1886 he qualified with the degrees of M B B S in 1910 and entered the Royal Navy as a Surgeon in 1912 Promoted Surgeon Lieutenant Commander in 1918 Surgeon Commander in 1924 and Surgeon Captain in 1935 he was placed on the Retired List in 1943 and reappointed until released Class A in 1947

During World War I Surgeon Captain Boal served in H M Ships *Temeraire Lightfoot Skirmisher* and at Malta Seaplane Station

During World War II he served at R N Hospitals Plymouth and Malta, R N Sick Quarters, Grimsby, R N Barracks Devonport and R N Auxiliary Hospital Newton Abbot.

Surgeon Captain J H BURDETT R N (Rtd) died on the 2nd July 1958 Born on the 5th February 1884, he qualified with the degrees of M R C S L R C P in 1908 and

entered the Royal Navy as a Surgeon in 1909 Promoted Surgeon Lieutenant-Commander in 1914 Surgeon Commander in 1920 and Surgeon Captain in 1933 he was placed on the Retired List in 1941 and re-appointed until released Class "A" in 1946

During World War I Surgeon Captain Burdett served in H M Ships *Prince George* and *Blonde* with R N Division and at Chatham Hospital

During World War II he served at Chatham Hospital R N Auxiliary Hospital Bootle, and R N Sick Quarters Isle of Man

In July 1916 he was mentioned in Sir Charles Munroe's despatch for distinguished and gallant conduct with M.E F

Surgeon Captain G D WALSH, R N (Rtd.) died on the 27th August, 1958 Born on the 26th July 1880 he qualified with the degrees of M R C S., L.R C P, in 1903 and entered the Royal Navy as a Surgeon the same year Promoted Surgeon Lieutenant-Commander in 1911 and Surgeon Commander in 1917 he was placed on the Retired List in the rank of Surgeon Captain in 1930

During World War I Surgeon Captain Walsh served in H M Ships *Dominion Diligence* and *Dartmouth*

He was re-employed during World War II and served at Chatham Barracks and H M Dockyard Sheerness

Surgeon Lieutenant Commander (D) H S GARE, R N died on the 12th September, 1958 Born on the 25th September, 1905 he qualified with the degree of L D S in 1928 and entered the Royal Navy as a Temporary R N V R Dental Officer in 1940 until released Class "A" in 1946

Surgeon Lieutenant Commander Gare re-entered the Royal Navy as a Surgeon Lieutenant Commander (D) for four years Short Service Commission in 1954 and was granted a further four years' Short Service Commission from May, 1958 At the time of his death he was serving at R N Barracks Portsmouth

HIGHER DEGREES

D O—Surgeon Commander P G Rowsell R N
D P.H—Surgeon Lieutenant J H Sewart R N

PROMOTIONS

To Surgeon Rear Admiral—W P E McIntyre (24 11 58)
To Surgeon Lieutenant-Commander—W B Wright (9 8 58)

TRANSFERS TO PERMANENT LIST

Surgeon Lieutenants—J W Alderson N J Blacklock T R W Hampton K T Hesketh D R B Mendis

ENTRIES FOR SHORT SERVICE COMMISSION

J Bertram, M B., B S. P M B Cannon M B B Ch M R C S, L R C P F C T Cooper M R C S L R C P J E Cox M B Ch B J R N Curt M B Ch B J F Davidson M B Ch B M Hatfield M B B S P S Hunter M B B S P Johnson M B Ch.B H N Mackenzie, M B Ch B R W K Neill M B Ch B J R Nicholson M B B S D R Potter M B B S M R C S L R C P R W Richardson M B Ch.B H M Tuddenham M B B S M R C S L R C P R W Turner M B Ch B, R S H Twidle, M B Ch B, B Clark B D S L D S R H Gee B D S L D S, H K Kemp B D S L D S I M Middlemass, B D S, D J Pickering L D S, D Wilson B D S

RETIREMENTS

Surgeon Rear Admiral E T S Rudd, *C B C B E*
Surgeon Captain P B Jackson.
Surgeon Commanders F G V Scovell J Carlton

APPOINTMENTS IN THE NAVAL RECRUITING SERVICE

(Final Medical Examining Officer)

Manchester area—Surgeon Commander K M Duthie R N Rtd , vice Surgeon Captain N A. H. Barlow R N Rtd.—1st September 1958

OSBORNE

APPOINTMENT OF HOUSE GOVERNOR

With the approval of Her Majesty The Queen the Minister of Works (The Right Hon Hugh Molson, M P) has appointed Surgeon Rear Admiral E T S Rudd *C B C B E* B.A., M *B.*, *B* Ch., F.R.C S (Ed) to be House Governor and Medical Superintendent of King Edward VII Convalescent Home for Officers at Osborne Isle of Wight in succession to Lt-Gen Sir Neil Cantlie, *K C B K B E. M C* F.R.C S Admiral Rudd will take up his appointment on 1st November 1958

WARDMASTER OFFICERS

PROMOTIONS

To Acting Wardmaster Sub Lieutenant—L Massey (23 7 58)

RETIREMENT

Wardmaster Lieutenant Commander D C Jenkins

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

PROMOTIONS

To Superintending Sister—Miss S K Cam
To Senior Nursing Sister—Miss V M Carter, Miss P N M Greader Miss B Harries Miss B K Howe.

TRANSFERS TO PERMANENT LIST

Miss S R. P Burton, Miss M E Collins Miss R F Fry Miss H E K. Gander, Miss A. S Robinson

ENTRIES FOR SHORT SERVICE COMMISSION

Miss J C C. Baxter, Miss P D L Bowyer Johnson Miss A. R L. Cook Miss P D Ford, Miss J A Franklin Miss S W P Hart, Miss E A Malpass, Miss P B Newton

TRANSFERS TO SHORT SERVICE COMMISSION

Miss D E Aubin Miss A Dunbar Miss N R Wallbutton

RETIREMENTS

Miss I A L Rollin *A.R R.C.*, Superintending Sister/Matron.
Miss J B Aikman *A R R C* Superintending Sister

ADMIRALTY FLEET ORDERS—1958

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